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The Week in Perspective

LABOR strife jumps to the forefront of American industrial problems. In Minneapolis and Toledo bloodshed is the harvest of months of ambiguity and evasion as to the real meaning of the collective bargaining provisions of NRA. Meanwhile, executives of the steel industry, assembled for the forty-third general meeting of the American Iron and Steel institute, came out positively against recognizing the Amalgamated association and reaffirmed their belief—based upon practical experience—of the fairness of employe representation plans as vehicles for settling problems.

Tested in Fires of Their Own Industry, Executives Are Logical Labor Leaders

Who could escape the question provoked by the appearance before the institute meeting of Eugene Grace, Tom Girdler, Ernest Weir, William Irvin, L. E. Block and others—all of them typifying the steel company executive who has risen from the ranks? If there must be a choice as to whether men of this type shall handle the problems of labor relations on the basis of their long experience as employes and employers—or whether the job shall be turned over under government compulsion to professionals like William Green or John Lewis—or to the more radical and less responsible leaders who now are promoting riots—can there be any question as to whom will be chosen by public opinion when all the facts are known? How long will the administration at Washington continue to penalize those who bear the responsibility of management at the same time it encourages racketeering by misguided, irresponsible agitators?

Schwab's Withdrawal from Institute Evokes Tribute to Years of Service

The "back to the land" movement gained some impetus as a result of the institute meeting. Closely following the declaration by Republic's chairman that "before he would recognize he would retire to his farm to raise apples and potatoes," Charles M. Schwab spoke feelingly of his resignation from the chairmanship of the institute—a move in the interest of health and rest, which will give him more time to devote to "raising chickens and livestock on the tops of the beautiful hills of Pennsylvania." Mr. Schwab appeared in his best form as the finished toastmaster, his voice and ease of delivery reminding one of the fluency of the late Chauncey Depew. The parting remarks of the farmer of Loretto—his swan song as an active officer of the institute—touched his listeners deeply.

Steel Chieftains Prescribe Caution on Confidence-Disturbing Legislation

Press accounts from Washington as to the President's attitude on the Wagner disputes bill have been confusing. Within the week it has been reported that the Chief Executive desires that a modified bill be passed before congress adjourns, and, to the contrary, that he will not urge it and that it has no chance of being enacted at this session. William A. Irvin, president, United States Steel Corp., took occasion at the institute meeting to criticize the Wagner bill severely, stating that it will defeat the purpose of its author, will tend to align employers and employes in opposing camps, and will promote antagonism instead of peaceful relations. Many executives referred to the securities bill and other pending legislation, which, in their opinion, retard the return of confidence. As for comment on NRA, the officialdom of steel seems disposed to go along with the steel code, with moderate revisions.

Research Experts Devise New Philosophy In Field of Carbon and Alloy Steels

What lasts but a day, yet lives for a year? An easy conundrum—it's the Institute! To executives and sales managers it's a big day in New York, but to the technical men in the mills and the laboratories there's enough in the papers to consume the time they have budgeted for self-improvement. Alloy steel at last has attained the eminence of a philosophy, a scientific framework to support the empirical knowledge of it; rarely has an Institute paper packed so many facts as that by Dr. Bain. Few men in the industry are better equipped than Mr. Chapman to appraise the challenge of welding to steel. And Mr. Marsh's report of the technical committee's studies of specifications for steel is a record of progress, a call to further achievement.

Aims of Steel Industry Are Clarified at Institute Meet

HISTORY was made at the forty-third general meeting of the American Iron and Steel institute, held Thursday at Hotel Commodore, New York.

Charles M. Schwab, conspicuous figure in steel for 50 years, active in the institute from its beginning, and since 1927 its president or chairman, asked to be relieved of the responsibilities of his office.

Eugene G. Grace, president of Bethlehem Steel Corp., and acting chairman of the institute's executive committee, was awarded the Elbert H. Gary memorial medal "for outstanding achievement in the iron and steel industry."

Tom M. Girdler, chairman, Republic Steel Corp., brought the long smoldering issue of labor relations out into the open by declaring that "we are not going to recognize the Amalgamated association or any other professional union"—a view which was later endorsed by other speakers.

Steel company executives, while favoring the extension of the steel code with certain modifications, pointed to the dangers of pending legislation which will tend to retard business confidence.

In his letter of resignation, Mr. Schwab stated that "it is with the greatest regret that I find it necessary to ask you to relieve me from the chairmanship of our institute. My state of health, my age, my inability to take any active part and the good of the institute make me feel that this step is imperative."

The institute's directors passed a resolution accepting the resignation, with the explanation that in fairness to Mr. Schwab, he should be permitted to retire from the chairmanship. Through the resolution the board paid a high tribute to the retiring leader for his distinguished attainments in the steel industry. The board did not name a successor to Mr. Schwab. Thus the post of chairman, and that of president, which was not filled when Robert M. Lamont resigned, both are vacant at present.

Following the chairman's address which is abstracted on page 12, Mr. Schwab introduced four steel company executives, who spoke briefly.

William A. Irvin, president of the United States Steel Corp., New York, condemned the pending Wagner labor bill, declaring its passage would hinder rather than help recovery. He declared he did not believe in standing still in the development of equitable industrial relationships, but that, with the business skies now clearing, the country must avoid mechanisms which would divide management and labor into two warring camps. He defended the present relationship between management and labor in the steel industry, but said that it could easily be broken.

Pending tariff legislation, unless further carefully considered, may lead to dire results for the steel industry, Mr. Irvin asserted. It might lead to dumping of foreign material at prices less than the cost of production in this country.

Constructive action that would lead to greater confidence is needed. Over the past four years, Mr. Irvin asserted, large replacement requirements have been built up, which would be released once confidence is fully restored.

Encouraging, he said, is the interest manifested by the railroads in equipment of new and advanced design, a matter in which the carriers are collaborating with the builders

Part of the crowd of more than 1200 *members and guests seated at the banquet of the*

and steel producers. This means expanding use of special steels. In fact, he said, modernized design in every form of mobile equipment is adding to this expansion.

The attitude of most steel producers with regard to pending labor trouble was voiced in no uncertain terms by T. M. Girdler, president of the Republic Steel Corp., Youngstown, O,. when he said:

"We are all reading about a big steel strike; that we will either recognize the Amalgamated association or shut down. I believe that it is the thought of everybody in the industry who has given it any thought, and most of us have, that we are not going to recognize any Amalgamated association or any other professional union. We will deal with our own employes and spend as much time as they want in talking things over. I think the result of this collective bargaining plan which has been carried out successfully by some of the companies for a long term of years, but which is new to other companies, has brought marvelous results."

L. E. Block, chairman of the Inland Steel Co., Chicago, appealed for continued co-operation of code members in solving the complex problems attending the operation of the steel code, adding that those in active direction of the code have a task which should demand the tolerance and patience of all.

Introduced by Chairman Schwab, as "the star of the industry," an allusion undoubtedly to his stand in the labor suit brought by the government, Ernest T. Weir, chairman of the National Steel Corp., Pittsburgh, declared he thought the emergency in industry was past, and that he did not think it was necessary to have any more emergency measures, such as the industry has had up to the present time.

While declaring there had been very definite improvement over past year, he spoke with certain caution in his appraisal of conditions. He believed that the peak of production for the present had been or will be reached this month and that the third quarter would show a sharp decline, attributing this in part to a growing lack of confidence in the industry.

Walter S. Tower, executive secretary, discussed the operation of the steel code. His address is presented on page 80.

Hail Grace's Leadership

In presenting the Gary medal to Mr. Grace, Chairman Schwab referred to the Bethlehem president's long service in the industry and particularly to his "ripened, selfish and resourceful leadership in formulating principles of self-government for our industry under the recovery act."

Mr. Grace, in accepting, paid a high tribute to the late Judge E. H. Gary for his fearlessness in dealing with "matters he believed to be wrong and needing correction" and his sense of "the importance of a favorable public opinion." Mr. Grace said, "We will do well to keep before us the traditions of our founder in dealing with the problems of today." The remainder of Mr. Grace's remarks are presented on page 12.

In the principal after-dinner address, Frederick M. Davenport, former congressman from New York, expounded a philosophy of enlightened industrial leadership. "We need have neither governmental regimentation nor private serfdom," he declared, "if a new, healing human attitude of American business guides the economic organization of the country into production on a wide scale of life, liberty and happiness for all our people . . . . Any national plan or program needs economic underpinning as well as social urge. It is good to pass prosperity around, but that cannot be done unless there is prosperity to pass around.

"It is probable that we shall save political democracy only through a wide extension of industrial good will and right dealing and a reasonable sharing of economic power and goods among all classes. As between any form of autocracy—fascist, bolshevist or nazi, on the one hand, and democratic self-government on the other hand, it is well to recall the dictum of Fisher Ames of New England one hundred years ago: 'Autocracy,' said he, 'is like a merchantman. She sails out of the harbor with pennants flying, in security and elation. But by and by she strikes a reef and down she goes. Democracy,' said he, 'is like a raft. You never sink, but damn it, your feet are always in the water.'"

The American Iron and Steel institute medal for the year 1933 was awarded to Ralph O. Griffis, Reid L. Kenyon and Robert S. Burns, research

forty-third general meeting of the American Iron and Steel institute, New York, May 24

laboratories, American Rolling Mill Co., for their paper "The Aging of Mild Steel Sheets," which was presented at the May, 1933, meeting.

Frank R. Frost, president, Superior Steel Corp., Pittsburgh, and E. L. Parker, president, Columbia Steel & Shafting Co., Pittsburgh, were named as directors of the institute at a meeting of the board Thursday. The election of Messrs. Frost and Parker increases the number of directors from 30 to 32, which is in accordance with the institute's policy of broadening the representation of the industry in the administration of the steel code.

Three technical papers were presented at the afternoon session. A progress report on the work of the institute's technical committee, presented by L. S. Marsh and abstracted on page 30 of this issue, was discussed by E. F. Kenney, metallurgical engineer, Bethlehem Steel Co., Bethlehem, Pa., and Jesse J. Shuman, inspecting engineer, Jones & Laughlin Steel Corp., Pittsburgh.

A paper on welding by Everett Chapman (page 34 of this issue) was discussed by J. F. Lincoln, president, Lincoln Electric Co., Cleveland, and F. T. Llewellyn, chairman of welding committee, United States Steel Corp., New York.

Discussions of Edgar C. Bain's study of characteristics common to carbon and alloy steel (page 25) were presented by H. W. MacQuaid, chief metallurgist, research and development department, Republic Steel Corp., Detroit, and J. L. Cox, chief engineer, The Midvale Co., Nicetown, Philadelphia.

We Shall Maintain The Open Shop

BY EUGENE G. GRACE

MR. SCHWAB this morning referred to the closeness of understanding existing in our industry between the employes and the management. This is easily understood by anyone acquainted with the personnel of the management in the steel industry. It exemplifies to a superlative degree graduates from the college of practical experience.

In mentioning but a few of the chief executives such as Irvin, Girdler, Weir, Block, Verity and Purnell, you only begin the list which will continue alike throughout the entire roll call. Men of this caliber and background are sympathetic and know from experience and contact the problems of the workman. Having been one of them they know what constitutes the proper relationships between employes and management and how to provide a system to insure that the interest of the employe is given fair consideration at all times and under all conditions.

Our employe representation plans are not highbrow or theoretical. They are thoroughly practical. They embody a mutuality of interest. They do not provide for outsiders or organizations to our industry to dictate to the men and management of the industry as to what constitutes proper relationships between them. We believe that is best supplied by the parties interested.

We have been criticized by organ-

Eugene G. Grace

ized labor because of our open shop beliefs and for the establishment of our employes representation plans but I believe I voice the opinion of everyone within my hearing when I say that we shall continue to maintain the open shop in the steel industry and by so doing insure to the employes the recognition and reward for individual effort as against the closed union shop where all men are equal.

Criticism we welcome. If we are wrong in any phase of conducting our business, either in relations to our employes or our public, it's a liability. The liabilities in a business require the management's attention. Assets usually take care of themselves, provided they are not destroyed or dissipated by an excess of liabilities.

We heard this morning a good deal about the new order of the day in the conducting of our business. The small producer and the large producer, the small consumer and large consumer, are for the first time on equal footing. Statements to the contrary, notwithstanding, competition is as keen and as free to operate as ever. The only change has been that dishonest and unfair practices for the good of all have been eliminated. We are proud of our record and accomplishments to date and are willing to accept full responsibility for them. All we ask for is confidence, patience and indulgence for there is still a great deal to be done.

So many radical changes have taken place in the method of conducting business that there is much to be learned. Experience alone must be our daily guide. Our business is an unusually complicated one. If we had but a single purpose, that of making pig iron or steel ingots, it would be relatively simple but integrated as the industry is, necessitating the production of many lines of finished steel products, both as integrated and nonintegrated companies, the latter dependent on the former for its semifinished steel, we recognize our water to be deep and in navigating our ship many shoals and rocks have to be avoided.

Few companies, since the depression took hold, have been able to show a profit. The industry as a whole still lost money in the first quarter of this year. This or no other industry can survive indefinitely on any such basis, for only by a profitable business can the interest of the stockholder, the employe, the management and the public be truly served and protected.

It is my sincere belief that through a more enlightened management of our industry, as now conducted and provided for in the new set-up of the American Iron and Steel institute, the public is beginning to appreciate and realize the earnestness and sincerity of our effort.

Now Is Time To Remove Barriers

BY C. M. SCHWAB

FOR the first time in my half-century in the steel industry, I have seen a year when the business of the industry could be conducted on a common sense basis. Never has there existed in the industry a more healthy and stabilized condition. The small producer has been placed on all fours with the large producer. The small consumer has been placed on a basis of equality with the large consumer.

This is due to the observance of policies of published prices. The whole situation is out in the open. Any mill knows exactly what the competition is, and is at liberty to meet it or beat it. All this is working to the stabilization of the economic condition of the workers, not alone to the workers in this indus-

(*Please turn to Page* 78)

Union Hints Strike June 16 As Industry Scorns Demands

JUNE 16 is the date set by the Amalgamated Association of Iron, Steel and Tin Workers for going on strike in event its demand for recognition is refused by the iron and steel industry.

This announcement was made at Pittsburgh Thursday by Michael Tighe, international president of the Amalgamated, following frank statements of executives at the spring meeting of the American Iron and Steel institute that they would not deal with "professional unions" and would stand on their present employe representation plans.

Unless sub-lodges of the Amalgamated get out of hand, it is evident that until the middle of June no concerted action will be taken by this organization. One of the tenets adopted at its Pittsburgh convention last month was that sub-lodges cannot make individual agreements, hence it is an "all or none" proposition, apparently.

No definite policy has been worked out, but it is probable that steelworks will be closed and no effort will be made to operate if any number of men walk out, As in 1919, when the Foster strike was conducted, one mill after another was shut down as men quit.

Recognition Sole Demand

Strictly according to schedule, the Amalgamated presented its demands for recognition last Monday, May 21. So far as known, no program for wages or hours was submitted, although there has been an undercurrent that a 30-hour week and $6 daily minimum wage is sought.

Over the country, between 150 and 200 separate formal demands were made, but inasmuch as some steel companies received demands at all of their plants, fewer than this number of companies is actually involved.

For the most part, registered mail was used by the Amalgamated, although in cases officers of lodges conferred personally with mill superintendents. The superintendent of the Carnegie Steel Co.'s Duquesne works, along with several other mill heads, refused to accept registered mail from the Amalgamated.

Some unusual complications are threatened. The Amalgamated sheet mill scale does not expire until June 30, and a blanket strike June 16 would break these agreements. Some producers now deal with the Amalgamated in their sheet departments but not in others, hence they already have been giving technical recognition to the Amalgamated.

To iron and steel executives the greatest menace of the situation is the fact that a small group can make trouble. Next is the certainty that in event the Amalgamated appears determined to call a strike, Washington will not permit so basic an industry as steel to be tied up, and can be relied upon to intervene. Such intervention might be precisely what the Amalgamated desires.

On the basis of the settlement of the automobile strike March 25, this intervention might take the form of elections to determine the strength of the comapny unions and any outside orgnaizations. Such intervention, however, would probably postpone any possible walkout until July, when midsummer dullness would have settled over the industry.

The greatest claim of strength made by the Amalgamated is 100,000 members—a figure executives contend is exaggerated. At present, total employment in the iron and steel industry is slightly under 400,000.

In the Pittsburgh district, an allegedly communist organization—the Sheet and Metal Workers' Industrial union—has injected itself with demands for a 6-hour day, 5-day week and $1 hourly minimum. One Pittsburgh producer concedes a showing of Amalgamated strength in its billet chipping crews. At another Pittsburgh mill, the Amalgamated claims only 800 members out of 17,000 employes.

Eastern Pennsylvania producers are watching the labor situation closely. Their plants apparently are less organized than those in the Middle West, and hence they believe that any widespread shutdown in the latter district would draw some tonnage east. They look for the government to step into the picture if a general tieup is threatened.

Leading companies in the Chicago district have received their ultimatums. So far, no replies have been made but every indication points to flat refusals. They expect to rejoin that their relations with employes through company unions preclude the question of recognizing an outside body.

Valley Producers Firm

In the Mahoning calley, no words have been minced. Speaking for the Republic Steel Corp., Tom M. Girdler, chairman-president, at the institute meeting Thursday declared recognition would be refused.

Youngstown Sheet & Tube Co., Youngstown, O., epitomized the sentiments of the industry when it said in a formal statement:

"We have had the employes' representation plan in effect at our plants for many years and through it have always dealt fairly with the problems arising between the company and the employes. This plan provides complete methods for negotiation between the men and the management and provides for carrying any matter, about which the employes may feel dissatisfied, through to the president of the company, and then to outside arbitration, if desired.

"We always have been and are willing to meet with any of our employes individually or through their chosen representatives on any matter affecting them. We believe that

The High Cost of Being an Amalgamated Member

AT AN iron and steel plant employing 3500 men the potential cost to these employes of belonging to the Amalgamated Association of Iron, Steel and Tin Workers is $177,000 a year.

This estimate has been made by James B. Finley, president of the Allegheny Steel Employes' union, Brackenridge, Pa., in which have been enrolled employes of the Allegheny Steel Co. The annual per capita charge of $50 would hold good for any plant.

Not included in this estimate is the charge of $25 for a sub-lodge charter and the initiation fee of $3, which for 3500 employes adds up to $10,525. For this sum the sub-lodge receives a seal, ritual, constitution and stationery. As Mr. Finley observes, "pretty expensive stationery."

Dues being $1.75 per month for employes earning $7.50 to $10 a day, $1.50 for $5 to $7.50 a day and $1.25 for $5 a day or less, the estimate for the 3500 Allegheny employes is $5125 per month.

When the general fund of the Amalgamated falls below $100,000, members are assessed 25 cents a month, which for Allegheny employes would total $875 a month. A 2 per cent extra assessment also is possible, which on the basis of $5 a day for 25 days a month would reach $8750.

The total of these monthly payments for the 3500 Allegheny employes would be $14,750, or $177,000 in one year, plus the $10,525 charter and initiation fees. Nor does this give effect to a clause permitting practically an unlimited assessment if voted by a majority of the local sub-lodge.

"When you're in you're hooked," Mr. Finley reasons.

the employes number among themselves men entirely capable of representing them in all matters of negotiation and that these men have a deeper and a more sincere interest in the welfare of their fellow employes in such negotiations than any outside organization, unacquainted with their problems, possibly could have."

One middle western independent steel manufacturer is reported to be negotiating with the Amalgamated association.

At present the only actual strikes in progress are in the southern iron ore mines and at the Latrobe Electric Steel Co., Latrobe, Pa., where a shutdown has resulted from insistence for recognition.

Conferences between the Amalgamated association and the Western Bar Iron association on renewal of their yearly contract start at Cleveland, June 6. Normally, the sheet scale meeting follows, but there is some talk that this meeting will be postponed.

A meeting of metalworking employes to line up with Amalgamated employes was to be held in Cleveland last Sunday, with automobile, coal, rubber and railroad workers also invited.

Additional Labor News

¶Great Lakes Steel Corp., Detroit, subsidiary of the National Steel Corp., Pittsburgh, is threatened with loss of its blue eagle as the national labor board has turned the corporation's case over to the director of compliance and the department of justice. The dispute arises over the alleged dismissal of two employes for union activity.

¶"Tin Plate Appreciation Day" was the way Monessen, Pa., steelworkers of American Sheet & Tin Plate Co. took it on themselves last week to honor steady employment for 1794 of their employes in the past year. Operations at this tin mill have averaged better than 80 per cent for the past year and while other steelworkers may have joined in strike rumblings in the industry, this little mill town, less than 30 miles south of Pittsburgh, had a gala day Saturday, May 26. Mill men committees planned a parade, athletic events, speeches and a concert.

Meetings

SEVENTEENTH conference of the open-hearth committee of the American Institute of Mining and Metallurgical Engineers will be held at Hotel Schenley, Pittsburgh, June 28-29.

Problems dealing with furnace construction wil be discussed at the opening session, following which members will participate in an inspection tour of the Homestead works of Carnegie Steel Co., Munhall, Pa.

Operating problems are scheduled for discussion at the opening session, June 29, and quality control at the closing session.

Financial

OTIS STEEL CO., Cleveland, reports net profit of $652,889 in the first quarter, after all charges, except federal taxes. In the first quarter of 1933 the deficit was $700,-371. Bond interest was defaulted on March 1; the next interest payment date is September.

¶Mesta Machine Co., Pittsburgh, has declared payable July 2 to June 16 record, regular quarterly dividends of 25 cents on the common stock and $1.50 on the preferred.

Foreign Trade

APRIL imports of iron and steel into the United States totaled 26,862 gross tons, a sharp decline from the 38,393 tons in March, but almost equal to the 28,061 tons of April, 1933. The decline in April is ascribed to pig iron, receipts being only 8253 tons, against 20,674 in March.

In fourh months, imports have totaled 113,313 tons, compared with 91,518 tons in the comparable period of last year, according to the iron and steel division of the department of commerce.

Production

REDUCTIONS in the Youngstown, Chicago and Buffalo districts lowered the steelworks operating rate 2 points to 57 per cent last week.

Operating rates in the Pittsburgh, eastern Pennsylvania, Cleveland-Lorain, Detroit, Wheeling and New England districts remained steady, with an increase of 1½ points in the Birmingham district. Details follow:

Youngstown—Declined 1 point last week to 61 per cent, off 6 points from the high of 67 per cent worked two weeks ago.

Chicago—Declined 2 points to 62 per cent, off 3 points from the year's peak. While additional decreases are anticipated during June, reductions are expected to be small in view of fairly heavy backlogs. Fifteen of the district's 36 steelworks blast furnaces are active.

Wheeling—Unchanged last week at 74 per cent, 29 out of the 39 open-hearth furnaces being active in the four district plants.

Pittsburgh—Held at 51 per cent last week, with a one-point decline to 50 per cent scheduled for this week. Two of the leading producers here continue to operate at between 50 and 55 per cent, with rates for the smaller independents ranging from 40 to 60 per cent. Bessemer output is maintained, with three district plants operating.

Number of active blast furnaces at Pittsburgh has recorded its first net decline since the week of Nov. 28, 1933. Twenty-six steelworks blast furnaces are now active, against 27 a week ago, Jones & Laughlin Steel Corp. having banked one of its Eliza furnaces. Among steel producers, rates are as follows: Carnegie Steel Co., 9 of 32; Jones & Laughlin Steel Corp., 6 of 11; Bethlehem Steel Co., at Cambria works, 5 of 7; National Tube Co., 2 of 4 at McKeesport, Pa.; American Steel & Wire Co. 1 of 2 at Donora, Pa.; Pittsburgh Steel Co. 1 of 2 at Monessen, Pa.; and Pittsburgh Crucible Steel Co. 1 of 2 at Midland, Pa.

Detroit—Unchanged at 100 per cent, all 17 of the district's open-hearth furnaces continuing in operation.

Birmingham—Increased 1½ points last week to 55 per cent, with 13 open hearths active. Some steel has been accumulated on yards and no dearth of raw material is anticipated for a long time to come.

New England—Continued at 84 per cent last week, but production schedules starting this week indicate two works will go to full capacity and raise the rate close to 89 per cent.

Buffalo—Declined 16 points to 50 per cent last week, with indications pointing to a further drop to 48 per cent starting this week. Eighteen open hearths are active, compared with a recent high of 26 for the district.

Central eastern seaboard — Unchanged at 45 per cent last week, with no change indicated for this week. There is some belief that the peak for this quarter has been reached.

Cleveland-Lorain—Steelworks operations held at 78 per cent last week, with Corrigan,McKinney Steel Co. operating 12 open hearths; Otis Steel Co., 7; and National Tube Co., Lorain, O., alternating between 11 and 12. No change in the rate is scheduled for this week.

¶Iron ore mined in the United States last year totaled 17,553,188 gross tons, according to the bureau of mines, Washington. This was an increase of 78 per cent compared with 1932, but 63 per cent below the average for the preceding five years. Shipments from iron mines last year reached 24,624,285 tons, valued at $63,776,033, an increase of 362 per cent in quantity and 394 per cent in aggregate value over 1932.

¶Output of pig iron in Canada in April at 27,355 gross tons compared with 12,101 tons in March. April

output breaks down into 22,190 tons of basic, 4719 tons of malleable, and 446 tons of foundry iron. In four months of 1934 pig iron production has totaled 82,332 tons, a year ago, 35,353 tons.

¶Sales of steel sheets by independent manufacturers averaged 9080 net tons daily in April, compared with 5104 tons in March, according to the National Association of Flat Rolled Steel Manufacturers, Pittsburgh. Output averaged 7150 tons, little changed from the 7106 tons in the preceding month, while shipments dropped to 6134 tons daily in April from 6476 tons in March. Totals for April: Sales, 272,412 tons; production, 214,522 tons; shipments, 184,042 tons. Unfilled tonnage May 1 was 251,123 tons; April 1, 159,672 tons. Total sheet capacity in the country for April was approximately 550,000 tons, and the capacity on which the association's figures are based was 325,000 tons.

Institute

ALMOST daily, formal announcement of extension of the NRA steel code is expected, the first renewal expiring Thursday, May 31.

Steel workers at McKeesport, Pa., last week sought a hearing Monday on extension of the code, but General Johnson refused it, saying a hearing was not required.

Steel has figured in many of the repercussions of the Darrow-Johnson row. The report of the recovery review board, of which Clarence Darrow is chairman, was bitterly critical of the steel code; to the defense of the code rose NRA Administrator Johnson and his chief counsel, Donald R. Richberg.

The NRA labor advisory board, on which organized labor has strong representation, has aligned itself with General Johnson, attacking the Darrow board for obtaining its information from "the rag-tag and bobtail elements of industry, irresponsible malcontents, sweatshop employers and business interests which have lost special privileges."

¶Senator Gerald P. Nye, Republican of North Dakota, on the floor of the senate Wednesday again attacked the steel code, claiming that it "has given greater favor to monopoly than monopoly has ever enjoyed heretofore at the hands of the government. Never has anything of its kind been permitted by the government as those being practiced day after day with the aid of government by the great steel corporations today."

¶Although a number of conferences have been held by the department of justice, the federal trade commission and NRA to decide whether the commission could act against steel producers for antitrust law violations when they are operating under their own codes, no definite decision has been reached.

Model at Chicago Fair Shows How Ford Will Roll Sheets

VISITORS at the Ford Motor Co. exhibit at the Century of Progress in Chicago, which reopened Saturday, will be able to watch the sheets go by, paraphrasing the Ford radio slogan, when they look at the model of the continuous strip mill which will be completed at the Dearborn plant of the Ford company by the end of 1934.

This model is 42 feet long, 1/24 of the size of the actual mill, and was built by the American Die & Instrument Works, Northside, Pittsburgh, under direction of the United Engineering & Foundry Co., Pittsburgh, which is building the actual mill.

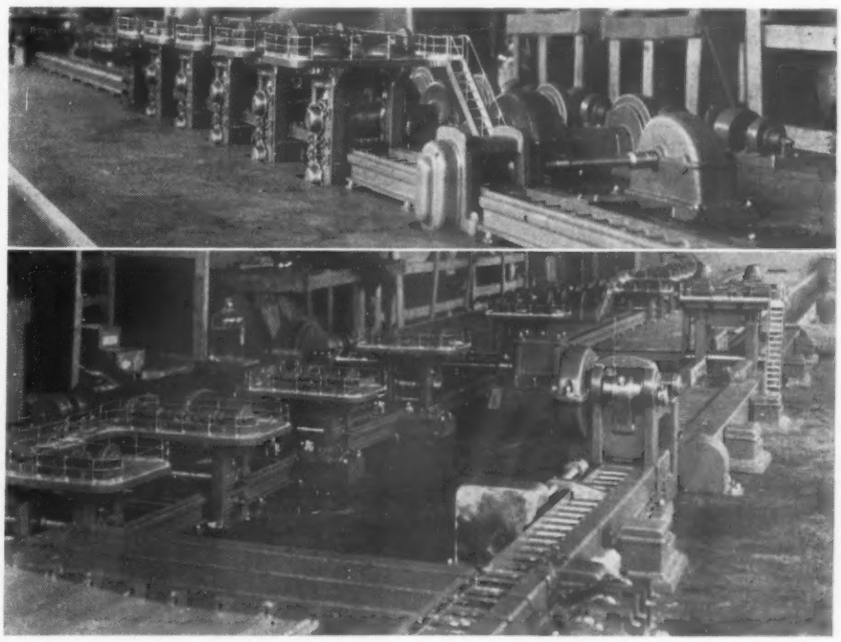
The top illustration shows the six finishing stands operated by roll drives, gears, etc., inside the gear housings in the right foreground. The lower view shows the blooming mill in the immediate right foreground, the four roughing stands and the flying shear in the left foreground and the finishing mill in the background near the door. Lead will be reduced to sheets on this model.

On the actual mill will be rolled steel for body and door panels, running boards, window trim, fenders, chassis frame stock and other parts. The blooming mill will have rolls about 38 inches in diameter and be driven by a 7000-horsepower motor. Ingots will be received from soaking pits and rolled into slabs about 35 feet long, the crop shear reducing the sections 4 inches thick and up to 48 inches wide to 15-foot lengths.

There will be 11 stands for reducing the 6000-pound-slab to a strip 1000 feet long and 1/16-inch thick. The first mill, called a scale breaker, breaks the rough scale on the surface of the hot steel into small particles, which are removed by water sprays. Preceding each of the last three stands of the roughing set is a set of vertical edging rolls. These stands serve to roll the edges of the slab or strip, thus controlling the width as well as producing the required rolling effect on the steel at its edges.

The strip leaves the last roughing stand at 420 feet per minute. It is fed into the first stand of the finishing train at only 150 feet per minute, but leaves the last finishing stand at approximately 1500 feet per minute due to the difference in thickness of strip entering and leaving this train.

Two types of roll stands are used, known as 2-high and 4-high. The 2-high with relatively large work rolls are best suited to take heavy reductions on the thicker slabs, while the the 4-high are best suited for the finishing stands of mills to give best results as to surface, uniform thickness of strip and minimum power consumption. A flying shear is located beyond the last of the finishing mills to cut the strip into lengths, or it may be coiled on reels.



Halt Radicalism, Free Capital, Durable Goods Group Urges

CREATING confidence—assuring investors that nothing is in prospect which will endanger the safety of their investment and the return of a fair profit."

This is the most important requisite to national recovery, President Roosevelt was informed Monday, May 28, by the durable goods industries committee in submitting a summary of its conclusions reached since it was organized in Washington, March 8.

Specific recommendations for various industries are not given, but steel, most of whose consumption is for durable goods, stands to benefit indirectly from the general program proposed. Steel and the metalworking industries were generously represented on the committee.

Interpreted baldly, the report might be construed as a recommendation that the administration and congress leave hands off business and drop legislation which has held back private capital. There is the inference that if this were done, there would be a flow of capital into the durable industries which would lift the present uncertainty.

Fundamentals for Recovery

Summarizing its studies, the committee cites the following as fundamental conditions for recovery:

"A free flow of private capital into private business.

"A sound real estate mortgage market.

"Industrial relations on a basis which will assure co-operation instead of strife.

"A balanced price parity between agricultural commodities and manufactured goods.

"The further re-establishment of confidence—most important of all."

For establishing this confidence the committee recommends this program:

"Assurance to private enterprise that the profit incentive will continue to receive public approval as an energizing motive for economic activity.

"Public recognition that the only legitimate purpose of taxation is to provide the necessary revenue for government and not to effect a punitive redistribution of wealth.

"Removal through the permanent balancing of the budget of the threat of uncontrolled inflation.

"Removal of any remaining threat of a sudden and arbitrary change in our monetary policies.

"Assurance that companies which have adjusted their business methods and policies to the temporary emergency program of the NRA will be free from the uncertainties of unreasonable or arbitrary administraices."

"Clarification of the government's policies toward measures and trends which are inconsistent with our economic system."

The report states that "labor must be given an opportunity to work and be self-supporting, not at the expense of any other group, but through the creation of those things necessary to sustain life and improve the standard of living of the whole country."

The keynote of the report was sounded in the assertion that "unemployment in services and trades is largely due to unemployment in the durable goods industries" and "over 85 per cent of the unemployment in the group producing goods is in the durable goods industries and nearly half of that is in construction, a basic industry, the activity of which influences all other industries and services."

After presenting figures showing that the average hourly wages now paid in the durable goods industries are substantially the same as were paid in 1929, the committee expressed the opinion that "durable goods industries cannot absorb increased costs" and that "reducing maximum hours will not spread employment" because "the long continued depression has practically precluded training younger employes to fill positions requiring special skill."

Hours Reduced to the Limit

Referring to the current legislative proposals, the committee reported:

"Reduction in maximum hours has already been carried to or possibly beyond the economic limit in the durable goods industries under present conditions. Further reduction in maximum hours with compensating increases in hourly rates of pay will not materially contribute to the reduction of unemployment.

"The durable goods industries, by reason of their present financial situation and the nature of their business, are unable to absorb additional employes or increased production costs until the sales volume of their products is expanded. Hence, any increase in wages or any increase in the cost of material must be passed on to the buyer of the product.

"The committee believes that any further general increase in wages at this time would retard and not encourage recovery. It is the committee's firm belief that in the durable goods industries, where purchases can be postponed indefinitely, further increases in costs and resultant increased selling prices would tend to reduce sales and employment.

"On the other hand, the committee recognizes that there are individual cases where adjustments have not been made in keeping with industrial adjustments generally, and where special conditions make wage increases and reduction in maximum hours possible. The committee recommends in such cases that such changes be made. In the opinion of the Committee no attempt should be made to effect blanket increases in wages or reduction in code hours by executive order."

Distributors Laud Heavy Goods Body

RESOLUTIONS indorsing efforts of the durable goods industries committee, defending the federal administration against attack on the NRA by a committee headed by Clarence Darrow and condemning the proposed Wagner bill were included in activities of more than 800 delegates to a convention in Cincinnati of Southern Supply and Machinery Distributors' association, National Supply and Machinery Distributors' association, and the American Supply and Machinery Manufacturers' association last week.

The program involved group meetings for discussion of problems of jobbers and manufacturers of abrasives, wrenches, electric tools and small power tools, pipe valves and fittings, chain hoists, mechanical rubber goods, saws, knives and files, refractories, tool holders, chucks, dogs and clamps, machinists' vises and pipe tools and power transmission. New officers are:

National Supply and Machinery Distributors' association: William T. Todd Jr., Pittsburgh, president; John T. Potts, Salt Lake City, and P. Ridings, Syracuse, N. Y., vice presidents; Charles K. Gartner, Chicago, G. Cheston Carey, Baltimore, and W. H. Carter, St. Louis, executive committee.

American Supply and Machinery Manufacturers' association: J. Harvey Williams, New York, president; L. M. Knouse, New Britain, Conn., and Harold D. North, Cleveland, vice presidents; W. H. Fisher, Chambersburg, Pa., treasurer; W. K. Lee, Grand Rapids, Charles E. Brinley, Philadelphia, W. A. Purtell, Hartford, Conn., Herbert Ladds, Birmingham, Ala., and Harold Buzby, Philadelphia, executive committee.

Southern Supply and Machinery Distributors' association: T. W. Lewis, Memphis, Tenn., president; Frank M. Archer, Bluefield, W. Va., and G. C. Weaks, Monroe, La., vice presidents; Carl Krueger, San Antonio, Tex., W. M. Givens, Birmingham, Ala., C. A. McAlester, Macon, Ga., and C. A. Dillon, Rawleigh, N. C., executive committee.

WINDOWS OF WASHINGTON

WASHINGTON

IN WASHINGTON the fact that dealings in stocks and bonds at New York and elsewhere throughout the country last week registered the lowest volume in 10 years, coupled with the fact that security prices continue to reflect weakness, can mean only one thing. The investors of the country do not yet view the future with confidence.

Contrasted with this stagnation in the security markets, the past week's program in the capitol city has been of a hectic complexion.

A man 77 years of age, knight errant of lost causes, a famous criminal lawyer, defender of murderers and weird criminals, has been holding the center of the stage. The attorney for a Loeb, a Leopold and a Scopes has become the spearhead of the widely spreading attack on NRA.

In a 155-page report—said to have been ghost written by a noted socialist writer, Charles Edward Russell—Clarence Darrow raked NRA fore and aft.

NRA Big Guns Fire in Defense

"Small enterprise is at the mercy of the large . . . the powerful ruin the weak . . . the codes aid monopoly," says the Darrow report, with specific reference to the steel, motion picture, ice, electrical manufacturing, coal and a few other codes.

The above deliberations were set forth in the majority report of the national board of review, signed by all members except John F. Sinclair, who in a minority report said "the board heard largely one side of the controversy—that of the complainant—and as a result the conclusion must necessarily be inconclusive, incomplete and at times misleading and unreliable."

But it was in a supplementary report that Mr. Darrow, it is believed here, expressed his real viewpoint. "The hope of the American people lies in the socialization of all industry," was his principal conclusion.

Masters of invective, NRA Administrator Johnson and General Counsel Richberg outdid themselves in replying to the Darrow report. The NRA reply ran through 155 pages, so that adding 155 pages for the Darrow majority report, six for the Sinclair minority report, five for the Darrow supplementary report and one for General Johnson's reply to the supplementary report, the total number of printed pages was 322. The controversy was one of the bitterest and most acrimonious in recent years.

Codes Will Not Be Abandoned

Washington is inclined to regard this controversy as another 10-day wonder and to believe the Darrow episode will be soon forgotten. For one thing, there are few leaders here who publicly would side with Darrow's outspoken demand for the socialization of industry.

But the rising clamor against NRA has become too loud and insistent to permit any assumption that this principal agency of the New Deal is in the clear. Members of congress who hitherto have been noncommital have indulged in fulminations against NRA—there have been demands in congress for an investigation of NRA. There are unconfirmed reports that the federal trade commission is preparing to lock horns with NRA by bringing a test case into the courts.

Under vigorous pressure from industries for continuation of their codes, General Johnson has concluded that no codes can be abandoned at present despite the widespread criticism of the administration because of these codes.

The general, however, has laid before President Roosevelt a plan for "rationalization" of the service trade codes—hotels, restaurants, barber shops, dry cleaners, etc., which sell service and not goods. He still hopes to cut down the great number of existing codes by merging the smaller codes into large industry group codes. During the past week the general had several conferences with the President, particularly regarding the steel code which comes up May 31 for extension beyond the trial period which expires that day. Unless the President objects, it is expected the steel code will be continued in effect, subject to certain modifications requested by the steel code authority.

On top of the increasing hostility toward NRA in the country at large, is a growing tendency on the part of important courts to render decisions against NRA. Most important of these adverse decisions is that of the federal district judge at Louisville who, in an opinion in support of his recent injunction under which western Kentucky coal mines are paying miners $4 for a 7-hour day instead of the $4.60 stipulated by NRA, declares, with reference to NRA:

"It is the boldest kind of usurpation, dared by the authorities and tolerated by the public only because of the bewilderment of the people in the present emergency. Every person at all familiar with the constitution and our scheme of government under it knows that no such power exists, and its mere academic assertion would be amusing, but its determined exercise is tragic."

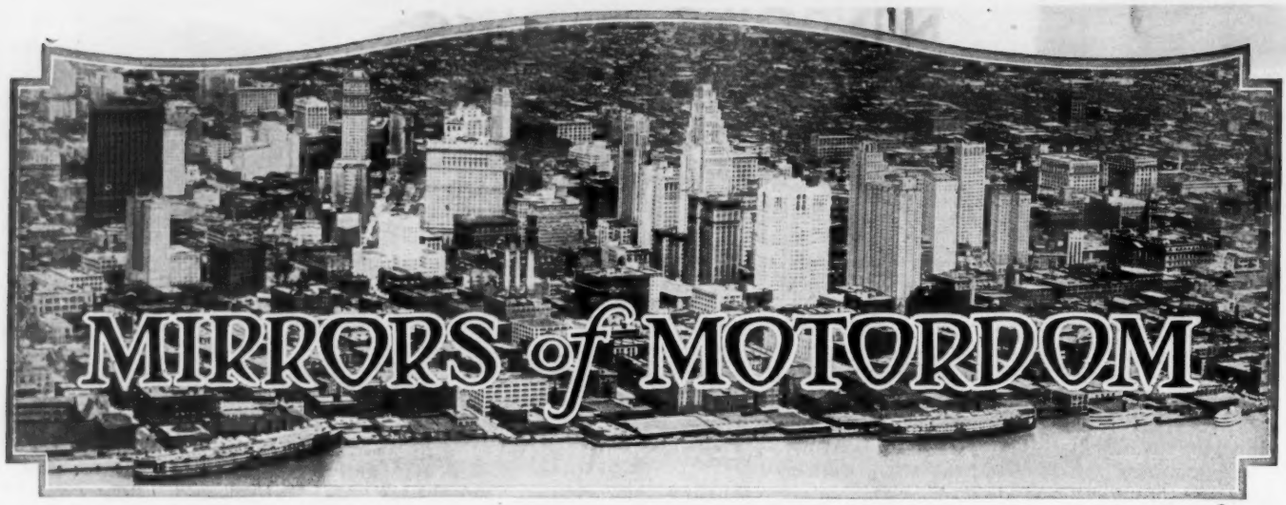
Adhere to Proposed Measures

Indications recently that there might be an administration shift away from the New Deal have proved misleading. This may be due to the fact that it again is becoming more difficult for the President to manage congress.

His silver message, to give silver a proportion of 25 per cent in the monetary reserve as against 75 for gold, is a political compromise with the silver bloc. The securities act of 1933 now seems not likely to be materially amended.

The stock exchange bill is expected to be passed in its present restrictive form. The bank "payoff" prin-

(*Please turn to Page 77*)



DETROIT

HAVING had a taste of heavy retail sales, monthly production exceeding 300,000 units and profits, automobile manufacturers are not going to relinquish them without a struggle. Realizing that increasing the f.o.b. price of cars some weeks ago was a mistake, the industry is now changing its tactics.

The new attack upon the prospective buyer's checkbook takes the form of "economy" cars—regular models, in most instances, trimmed down to a lower price level. Outside forces, such as widespread labor difficulties, may have taken the bloom off the market for the remainder of the spring, but the industry is preparing nevertheless to counter-attack the present slump.

Chevrolet already has its standard series, which of course duplicates its position last year. Buick has followed with its series 40, and now Hudson has added the Challenger to the Terraplane line.

Dodge last week started assemblies on its new low-price car, which will lack an automatic choke and will have smaller hub caps and headlamps.

Pontiac has a companion 6-cylinder car on the boards. Ford long has had a small eight ready for the word of production.

Steer Clear from New Names

It is noteworthy that these new "economy" cars are not companion cars in the sense that they bear another name. The industry has not forgotten what happened to Buick's Marquette, or Studebaker's Erskine or Old's Viking.

In this newest strategy the industry will try to capitalize on the good will of an established name. In other words, Detroit reasons that a car such as the Buick 40 would logically be a success at this time only if tagged a Buick; so with Dodge and the others.

Packard, whose assembly line is now closed except for production of a few custom jobs daily, is observing the usual shutdown it takes annually, but somewhat earlier this year. When volume assemblies resume, probably not until after July 1, according to present plans, both the small Packard and the regular 1935 eights and twelves will be coming off the line.

Obviously a share of the new Packard tool and die work has been let out and it is reported that on some work new Ohio sources of supply have benefited. Speaking of tool and die work, that trade understands that this coming week, or perhaps shortly after June 1, some $1,000,000 in Detroit tool and die work will be ready for contracting. This is an aggregate figure and represents the first large lot of work of this nature for 1935. All important motor car builders are reported to have some share in this $1,000,000 total.

GM Turning to All-Steel Body?

Speaking of 1935 automobiles, close observers are wondering whether General Motors, through its Fisher Body unit, will go to the all-steel body. For several months, Fisher advertising has been conspicuously silent on the combination wood-steel body which it has claimed superior to the all-steel type.

Chrysler, Ford and Hudson have been carrying the flag for the steel body. Since General Motors at present is accounting for about 30 per cent of all automobile production, its conversion to the all-steel body type would greatly increase the requirement for steel.

Incidentally, Detroit believes there is no group more eager for work today than the tool and die craftsmen. Long deprived of work, this union has been losing additional ground through internal dissension. The threat of removing much of the 1935 tool and die work from Detroit also has had its effect.

After declining for three consecutive weeks automobile production turned up last week. The gain was fractional, insufficient to be accounted a trend. For the week ended Saturday, May 26, *Cram's Reports* estimates assemblies at 76,281 units, compared with 75,550 the week preceding. The high for the year was 99,336 units in the week ended April 28.

Ford Still Leads Auto League

Ford last week held steady at 23,485 units, this exceeding the total for all General Motors units and also being larger than the Chrysler aggregate. Chevrolet increased 1150 units to 17,250 units. Plymouth held unchanged at 12,000. Buick, which was closed in the week ended May 19, accelerated to 2850 units last week.

Other rates of assembly for the week ended May 26, with the change from the preceding week, are: Auburn 240, unchanged; Cadillac 550, up 10; Chrysler 1950, unchanged; DeSoto 1200, unchanged; Dodge 2850, down 650; Graham 340, off 110; Hupp 220, off 130; Nash 1625, unchanged; Olds 3600, up 300; Pontiac 1500, unchanged; Reo 650, unchanged; Studebaker 850, unchanged; and Terraplane-Hudson 2500, down 1100.

Graham has gone to a 4-day week. DeSoto has released parts for 1500 airflows for the first half of June. Hupp has slackened releases on parts for the 15,000 "juniors" that were planned.

Final figures on April output of passenger cars and trucks in the United States, by the department of commerce, give the month a total of 360,620 units, compared with 336,013 in March. This exceeds any month since the early summer of 1931.

In four months of 1934 total production in the United States has been 1,093,103 units, more than double the 535,690 units turned out in the comparable period of 1933.

Industrial Men in the Day's News

Robert E. W. Harrison, Chief, Industrial Machinery Division, Bureau of Foreign and Domestic Commerce

Wide acquaintanceship among engineers in this country and abroad assists him in his new association.

For a number of years he directed engineering and sales activities of a leading machinery builder.

Author of a number of technical papers, he also serves on various committees of engineering societies.

ROBERT E. W. HARRISON, who as noted in STEEL for April 16 has been appointed chief of the industrial machinery division of the bureau of foreign and domestic commerce, Washington, succeeds W. H. Rastall, long active in this governmental position.

After extensive experience in foreign markets, Mr. Harrison in 1926 was named mechanical engineer for the Cincinnati Milling Machine Co., Cincinnati. Later a subsidiary of this company was incorporated—Cincinnati Grinders Inc.—and he was appointed director and chief engineer responsible for all engineering activities of the two companies. Subsequently, when sales and engineering were combined, he was appointed sales engineering director.

In 1932 he established a consulting engineering practice, being retained by a number of companies as consultant on problems of design, management and marketing.

He is at present chairman of the committee for standardization of tolerances and allowances for cylindrical parts and limit gages, organized by the American Standards association. He is secretary of the executive committee of the machine shop practice division of the American Society of Mechanical Engineers, and a vice president of the Society of American Military Engineers (Cincinnati).

Mr. Harrison has become well known among engineers in this country and abroad for his numerous papers presented before technical societies, dealing with problems of precision grinding, milling and other machine shop processes.

He is a captain in the special reserves of the army, and has been awarded the Croix de Guerre, Victory metal, Allies medal and other decorations. In his new post he will assist American machinery and agricultural implement manufacturers in efforts to develop profitable markets.

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David P. Williams has been elected vice president of the Vulcan Mold & Iron Co., Latrobe, Pa. A graduate of Yale university in 1925, he has been active in the company since that time in various capacities. His father, the late Col. E. H. Williams, was founder and former president of the company; his brother, Edward R. Williams, is now president.

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R. H. Anderegg has been made vice president in charge of engineering of the Trane Co., LaCrosse, Wis., manufacturer of air conditioning and heating equipment. He has been connected with the company for a number of years in the capacity of chief engineer and divisional sales manager.

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Harry L. Myers, formerly hot mill superintendent has been appointed assistant works manager of West Leechburg Steel Co., West Leechburg, Pa. With the company for the past 19 years, at one time he was night mill superintendent and later superintendent of hot mills.

R. C. Gray has been appointed superintendent of hot mills for the West Leechburg company. He has been with the company for 25 years and formerly was superintendent of cold mills.

Irvine Shoff, formerly chief inspector, has been made night superintendent. Elby Coy has been appointed chief inspector, formerly having been assistant cold mill superintendent.

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Joseph G. Shryock, chief engineer of the Belmont Iron Works, Philadelphia, was recently awarded a certificate of merit by the Franklin Institute of Philadelphia "for his ingenious combination of standard, structural shapes in the formation of a light bridge floor," known to the trade as the Belmont interlocking channel deck.

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Walter F. Sheetz, vice president of R. C. Mahon Co., Detroit, structural steel fabricator, heads a new sales engineering office of the company, established at 231 South La-Salle street, Chicago. The company's products include steel roof decks, acoustical ceilings, permanent floor forms,

Walter F. Sheetz

rolling steel doors, roof sumps, spray booths, blowpipe systems, ovens and ventilating equipment.

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William Lloyd, for many years identified with the design, manufacture and sales of Coxe stokers, again has become associated with the engineering department of the Combustion Engineering Co. Inc., New York. About 1914 he was named president of the Coxe Stoker Engineering Co.,

subsequently affiliated with Combustion Engineering.

B. J. Cross, from 1921 to 1931 associated with the engineering activities of the Combustion company, has re-joined the engineering department. He will be engaged in development and research work under direction of John Van Brunt, vice president in charge of engineering. Prior to 1921, Mr. Cross was identified with the bureau of mines, conducting research on the burning of fuels.

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E. A. Herr of Dayton, O., has been appointed purchasing agent for Servel Inc., Evansville, Ind. For a number of years he has had experience in the purchasing of refrigerator materials.

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Arthur E. Schnell, for the last two years supervisor of the valve department of Aluminum Industries Inc., Cincinnati, has been made plant superintendent.

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R. J. Lamont has been elected vice president and general manager of Todd Dry Docks Inc., Seattle, succeeding the late Allan R. Hunt. J. D. Haines has been named a vice president. Both Mr. Lamont and Mr. Haines are veteran members of the organization.

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Walter F. Titus has been appointed assistant to the president of International Business Machines Corp., Endicott, N. Y., in direct chagre of all operations at the plant. Appointment was made on the twenty-fifth anniversary of Mr. Titus' affiliation with the company.

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M. N. Aitken, actively identified with the distribution of industrial process controls for the Mason-Neilan Regulator Co. in Chicago and Philadelphia during the past several years, has become affiliated with Maintenance Engineering Corp., Houston, Tex., serving in a sales and engineering capacity.

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C. E. Davis, general superintendent, Homestead Valve Mfg. Co., Coraopolis, Pa., has been elected president of the Pittsburgh Foundrymen's association for the ensuing year. A. M. Ondreyco, Westinghouse Air Brake Co., Wilmerding, Pa., has been named vice president and C. H. Paul, Mackintosh-Hemphill Co., Pittsburgh, has been re-elected secretary-treasurer.

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Dr. O. E. Bransky, manager of the Whiting, Ind., refinery of the Standard Oil Co. of Indiana, has been appointed assistant general manager of manufacturing at the Chicago office of the company.

Dr. E. J. Shaeffer, recenly general superintendent, succeeds Dr. Bransky. F. D. Rexwinkle has been made general superintendent. Dr. R. T. Myrick, formerly head of the light oils department, succeeds Mr. Rexwinkle.

Died:

TAYLOR ALLDERDICE, 71, president of National Tube Co., Pittsburgh, until his retirement in 1928, at his home in Pittsburgh, May 20. A prominent citizen of Pittsburgh and a leader in business life there for more than 30 years, he was born in Philadelphia in 1863 and went to Pittsburgh at an early age. He first became identified with Pittsburgh Bessemer Steel Co., Homestead, Pa., which later was absorbed by Carnegie Steel Co., and shortly afterward became superintendent at the plant. After several years he was made superintendent of the Pottsville Iron & Steel Co., Pottsville, Pa.

Taylor Allderdice

Later he was appointed superintendent of the National Tube Works Co., subsequently known as National Tube Co. His rise with National Tube was successively through the positions of superintendent, manager, third vice president and, in 1926, president. Mr. Allderdice was, among many other affiliations, a director of Pittsburgh Screw & Bolt Corp., and Keystone Sand & Supply Co., both of Pittsburgh. He was also a member of the American Iron and Steel institute.

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Clarke J. Madgett, 48, Toronto, Ont., manager of the Sarnia Bridge & Steel Co. Ltd., in Toronto, May 18.

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Frederick De Coningh, 70, retired president of the Sykes Steel Roofing Co., Chicago, in that city, May 20, after a short illness. He was born in Lisse, Holland.

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Harry G. Francis, 70, president of the Charles E. Francis Co., a foundry at Rushville, Ind., in Cincinnati, recently, on his return from Florida. He was also president of the Dill Foundry Co.

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John J. Heller, 83, last of three brothers who in 1873 founded the Heller Bros. & Co., Newark, N. J., tool manufacturers, at his home in Madison, N. J., recently. He had retired 20 years ago.

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James R. Smith, 51, for more than 20 years identified with the Taylor-Wharton Iron & Steel Co., High Bridge, N. J., and for more than ten years special representative for the company at Cleveland, in Pittsburgh, May 20.

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Warren Wrightsman, 75, inventor and owner of a number of automobile patents, at his home in Kokomo, Ind., recently. At one time he operated a machine shop, and was active in development of the first Haynes automobile.

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Clyde E. Lowe, 49, president of the Clyde E. Lowe Co., Cleveland, manufacturer of rubber mill machinery, in Cleveland, May 19. At one time sales representative for the Fitzsimmons Steel Co. of Youngstown, O., he founded his own company in 1918.

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William J. King, 64, president and general manager of the King Tool & Grinding Co., Cleveland, at his home in Lakewood, O., recently. He founded his company in Saginaw, Mich., in 1916 and moved it to Cleveland in 1919. A son, Byron W., continues the business.

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Jack Howard, 69, president of the Ross & Howard Iron Works Co. Ltd., Vancouver, B. C., at his home in that city, May 16. He was well known in iron and steel circles of the province.

□ □ □

Dr. William Hoskins, 72, head of the firm, Mariner & Hoskins, Chicago, consulting chemical engineers, at his home in La Grange, Ill., May 18. He made important contributions to the development of resistance wire used in heating devices, in addition to other chemical processes. He was president of the Chicago section of the American Chemical society in 1897 and was first president of the Chicago Chemists club in 1919.

□ □ □

MacCormick G. Moore Sr., president of M. G. Moore & Co., Reading, Pa., iron and steel brokers, in Reading, May 21. Born in Wilmington, Pa., he held positions in the navy department in Washington and later with a steel company in Chester, Pa. In 1906 he removed to

(*Please turn to Page* 79)

Foreign Trade Trend Masked By Heavy Scrap Movement

EXPORTS of steel scrap have assumed such volume in recent months that they tend to obscure the foreign trade situation unless they are given special consideration.

Being a raw material, scrap exports are of less significance in an industrial way than partly or wholly manufactured products. Yet it happens from time to time that export statistics show an increase or decrease from the preceding month in which the heavy scrap export reverses the true picture.

When an increase in total exports is shown it sometimes is true that manufactured exports have declined; conversely, sometimes a smaller total of exports is reported when manufactured exports have increased.

As a result of this situation a truer picture of the effect of exports on industrial production is obtained if scrap exports are deducted from the total and fluctuations of manufactured exports are considered alone.

Instances of increase in total with a lessening of manufactured exports are shown in the accompanying chart in May and November, 1932, and in February and March, 1933. Decrease in total exports with a gain in manufactured goods is found in June and September, 1933, and January, 1934.

Sharp Rise Caused by Scrap

A further distortion is produced by scrap volume lifting total exports in far greater degree than the increase in manufactured exports, as is shown in March, 1934, when the total of exports increased 110,085 gross tons over February, while exports of manufactured goods increased only 12,804 gross tons.

The trend line of iron and steel exports as a whole is rising about twice as fast as that of manufactured iron and steel goods, the upward swing being due to the rapidly mounting tonnage of steel and iron scrap going to Japan, Poland, Italy and other consuming countries.

The highest total of scrap shipments to foreign countries was in March of this year when 173,165 tons was loaded. December, 1933, was another heavy scrap export month, with 100,983 gross tons shipped. For six months past, scrap exports have approximated half the entire tonnage of steel and iron exported, in some instances being well over half.

Japan is the largest buyer of old material and cargoes for her ports are cleared from Atlantic as well as Pacific shipping points.

Too close attention to the volume of steel and iron exports without analysis of the scrap angle may in future lead to the conclusion that our export business is falling off, should present buyers of scrap lessen their purchases. This conclusion might easily be erroneous as an increase in foreign sales of manufactured steel goods might be taking place in face of a decrease in total shipments.

Here and There In Industry

PATTERSON FOUNDRY & MACHINE CO., East Liverpool, O., held its annual sales convention there May 16-19. District sales managers and representatives were present from Boston, New York, Philadelphia, western Pennsylvania, Detroit, Chicago and other points. Illustrated lectures on improvements in manufacture and broadening of application of the company's products were given. A banquet and entertainment at President R. L. Cawood's hunting lodge, in the hills, closed the meeting.

□ □ □

Pump Service & Equipment Co., Indianapolis, has moved its offices to 155 East Market street.

□ □ □

Luria Bros. & Co. Inc., dealer in steel and iron scrap and allied lines, has moved its main offices to the Lincoln Liberty building, Philadelphia. A branch office will be maintained in the Colonial Trust building, Reading, Pa.

□ □ □

Universal Power Equipment Corp., Cleveland, has appointed Welding Equipment & Supply Co., 3524 East Seventy-fourth street, Cleveland, its sales representative for northern Ohio for arc welders, electrodes and accessories.

□ □ □

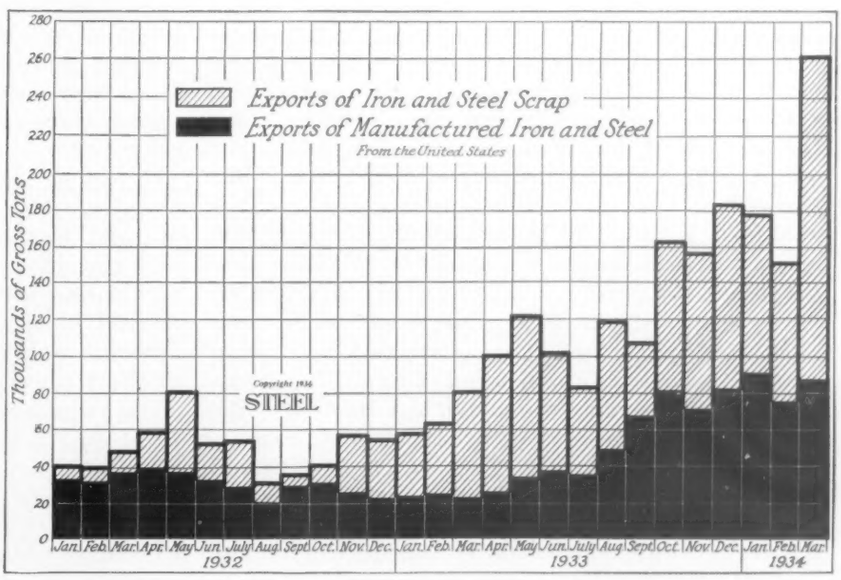
Big Savage Fire Brick Co., and Standard Arch Co., both of Frostburg, Md., have recently opened a branch sales office at 1904 Law and Finance building, Pittsburgh, in charge of David A. Benson Jr. and C. A. Anderson.

□ □ □

Economy Pumping Machinery Co., Chicago, is low on 16 gasoline motor-driven bilge pumps for the Ft. Peck dam dredges on recent bids to the Kansas City army engineers. Other bidders included Johnson Motor Co., Waukegan, Ill., Yeomans Bros. Co., Chicago, and Star Boat & Motor Co., Kansas City, Mo.

□ □ □

Chicago, Milwaukee, St. Paul & Pacific has placed an order with the Timken Roller Bearing Co., Canton, O., for bearings and boxes for 50 deluxe passenger coaches the road is building in its own shops at West Milwaukee, Wis. A sample of these cars, contructed experimentally, will be exhibited at the Century of Progress at Chicago this summer. This railroad was the first to adopt roller bearings on its transcontinental trains and 157 cars have been so equipped, including 72 Pullmans.



EDITORIAL

Theory versus Practice in Reforming Steel Industry

DURING the past few months the editors of this publication have received numerous letters from students in high schools, preparatory schools and universities reading substantially as follows:

> "For my graduating thesis I have chosen the subject, 'The Economic Status of the Iron and Steel Industry.' Please send me literature about the steel industry and any information, statistics, etc., which you think will help me to understand the subject."

We have welcomed this apparent interest in one of the great basic industries of the United States and have tried to furnish our correspondents with information which will provide a general picture of steel in the economic structure of the nation. No doubt, the students to whom this material was sent have spent scores of hours in reference libraries, have talked with friends who know something of the steel industry and have exhausted other convenient means of acquiring knowledge of the subject. Probably the majority of the resultant theses reflect great credit upon their youthful authors, considering the fact that none of them in a few months' time can do more than grasp the broadest aspects of the intricate subject they have chosen.

Steel Industry's Problems too Complicated For Solution by Superficial Observation

Perhaps it is this hopelessness of understanding the problems of the steel industry through superficial observation and study which reminded us of the students' theses when, a few weeks ago, we read the voluminous but incomplete and inaccurate report on the steel code by the federal trade commission, and again last Monday, when we perused that part of the Darrow report pertaining to the iron and steel industry. The chief weakness of both reports lies in the fact that the authors, even if all of the evidence pertinent to the problems involved had been available, could not possibly digest it and interpret it properly in a few weeks or months.

But unlike the student writers of theses, who presumably approached their studies with open minds, the agricultural-minded trade commissioners and the lawyer—iconoclast Darrow—and four of his five associates assumed their respective tasks with firmly planted, pre-conceived prejudices against the steel industry. The commissioners were spurred by the apprehension that NRA would permanently encroach upon the prerogatives of their commission. Every instinct of Darrow called for a report denouncing the "big" and pleading for the "little fellow."

Under such circumstances, the two reports (which for all practical purposes may be considered as one, since the Darrow document is but a thinly disguised rehash of the trade commission's attack upon NRA) can serve only to attract a certain amount of attention to the difficulties of NRA and to certain well known internal problems of the steel industry. The reports may conceivably help to crystallize public opinion as to the direction of future policies in NRA, but they will contribute nothing to the solution of the problems of competition, basing points, price policies, etc. within the steel industry.

Theory Alone Does not Meet Conditions; Practice Has Achieved Much Betterment

The trouble with all superficial studies of competition and the price structure is that the reformers do not differentiate between theory and practice. It is not difficult to make an excellent case against the multiple basing point system on theory alone. It is reported that a learned professor, sitting on a committee of the consumers' advisory board, once made an eloquent plea for straight delivered prices for the steel industry. A youthful member of the committee, who had some knowledge of the industry, asked, "What will your plan do to the four-billion dollar investment in plant and equipment?" The elderly savant replied, "Who cares about the investment; if the principle is right, why not adopt it?"

Here is the crux of all discussions about changing the policies of the steel industry. Today's practices are the best that the industry has been able to evolve through nearly 60 years of experience. It may be granted that the industry's leaders have not always been as alert or as foresighted as they might have been. On the other hand, the industry has made encouraging progress—probably as much as any of the older basic industries.

Reforms cannot be adopted as casually as one changes a suit of clothes. The old must be merged into the new gradually. If the critics had the ability to know how much competitive conditions in the steel industry have been improved in recent decades—if, in fact, they possessed even a crude sense of perspective, the tone of their reports would be more constructive.

Improvement will come primarily from enlightened leadership within the industry. The whip of censure from outside, while effective at first, is of little avail after the novelty wears off, and is utterly useless when it is wielded by individuals whose minds are poisoned by prejudice.

THE INDUSTRIAL DIAL

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The Business Trend Section of STEEL
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DEFINITE signs of the anticipated recession in business were forthcoming in the last half of May. The easing off of the pace of automobile output, the gradual decline of railroad freight traffic, the uncertain fluctuations in electric power demand and the turning point in steelmaking operations furnished unmistakable evidence that the spring upturn of 1934 had come to an end.

Notwithstanding these tangible signs, industrial activity still is far ahead of business sentiment. For reasons that are hard to determine, the mood of industrial executives has been at variance with actual conditions for several months. This might have been attributed to the cranky behavior of the stock market, if it were not for the fact that the volume of business gained in almost inverse ratio to the decline of security values. Again, it might have been charged to government policies, yet business improved in spite of the indecision at Washington. In recent weeks, the injection of the silver question may have been a factor, yet it should have been less disconcerting than some of the previous monetary policies of the government.

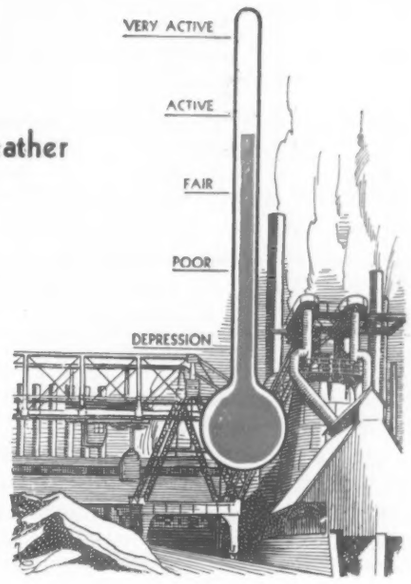
Confronting industry in the next few months are refinements of policy in NRA, which in the long run may influence business to a considerable extent. Some effort probably will be made to co-ordinate prices, and the conflict between higher costs resulting from codification and the prices which will attract volume purchasing will necessitate difficult adjustments in the recovery program.

Also, the troublesome labor problem of section 7a of NRA still is far from settled. The threat of the Amalgamated will call for an answer in June. The outcome is uncertain at this writing.

Industrial Weather

TREND:

Hesitant



The Barometer of Business

Industrial Indicators

	April, 1934	March, 1934	April, 1933
Pig iron output (Daily average, tons)	57,873	52,438	20,786
Machine Tool Index	.....	.....	14.9
Finished Steel shipments (tons)	643,009	588,209	335,321
Ingot output (Daily average, tons)	117,425	103,600	54,514
Dodge Bldg. awards in 37 states (sq. ft.)	14,207,100	14,788,900	10,870,400
Automobile output	379,025	370,173	189,284
Coal output, tons	24,977,000	38,392,000	19,523,000
Business failures; number	1,052	1,102	1,921
Business failures; liabilities	$25,736,975	$27,227,511	$51,097,384
Cement production, Bbls.	.....	5,257,000	4,183,000
Cotton consumption, bales	513,000	543,690	470,685
Car loadings (weekly av.)	583,708	611,843	460,300

Foreign Trade

	April, 1934	March, 1934	April, 1933
Exports	.....	$190,000,000	$105,000,000
Imports	.....	$158,000,000	$88,000,000
Gold exports	.....	$44,000,000	$16,741,000
Gold imports	.....	$237,612,000	$6,769,000

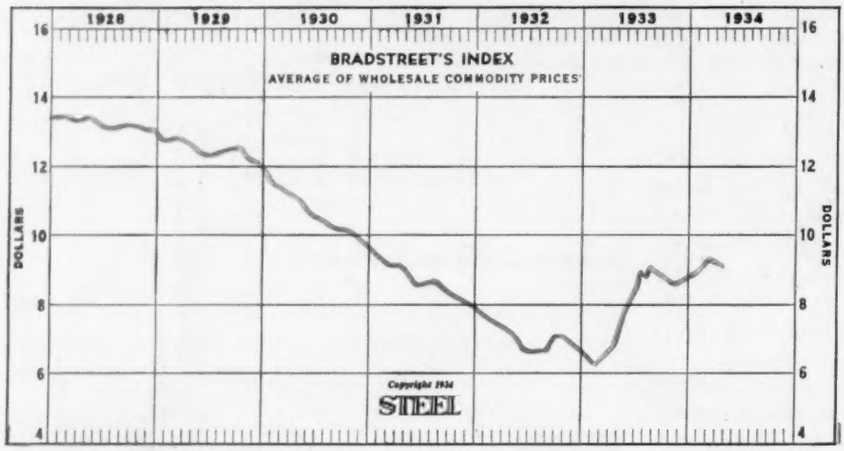
Financial Indicators

	April, 1934	March, 1934	April, 1933
25 Industrial stocks	$144.84	$142.56	$97.20
25 Rail stocks	$39.88	$38.99	$22.97
40 Bonds	$83.94	$81.25	$62.36
Bank clearings (000 omitted)	$21,511,812	$19,598,162	$14,663,568
Commercial paper rate N. Y. (per cent)	1¼	1¼	3
*Commercial loans (000 omitted)	$4,604,000	$4,647,000	$4,706,000
Federal Reserve ratio, per cent	69.2	68.2	62.6
**Railroad earnings	$52,047,881	$29,281,008	$10,815,304
Stock sales, N. Y. stock exchange	29,846,502	29,915,969	52,901,343
Bond sales, par value	$362,200,700	$319,673,300	$271,297,200

*Leading mamber banks Federal Reserve System.
**March, February and March, respectively.

Commodity Prices

	April, 1934	March, 1934	April, 1933	Monthly Av. 1913
STEEL's composite average of 14 iron and steel prices	$34.18	$32.40	$28.16	$26.32
Bradstreet's index	$9.15	$9.16	$6.98	$9.21
Wheat, cash (bushel)	98c	$1.05	90c	92c
Corn, cash (bushel)	61c	65c	51c	51c
Petroleum, crude (Bbl.)	.....	98c	42c	$2.50



	1934	1933
May 1	$9.15	$6.98
April 1	9.16	6.53
March 1	9.26	6.35
February 1	9.01	6.53
January 1	8.83	6.79

The fact that steel operations may be slackening at the critical period may prove to be a factor favorable to a peaceful settlement. The wave of local racketeering and jurisdictional labor strive may inflame public opinion against strikes, which would be a powerful favorable influence. Again, government action in either direction might affect the outcome.

Right now the business outlook is somewhat obscured by these impending developments. No serious set back seems imminent. In fact, the volume of business may continue to run far ahead of business sentiment.

Where Business Stands

Monthly Average, 1933—100

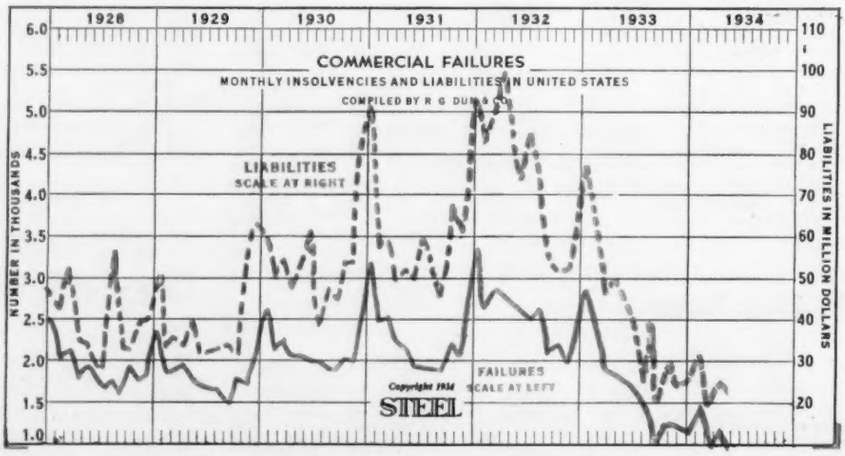
	April, 1934	March, 1934	April, 1933
Steel Ingot Output	159.1	140.4	73.8
Pig Iron Output	159.8	144.8	57.4
Freight Movement	104.8	109.8	82.6
Building Construction	115.9	120.7	88.7
Automobile Output	224.6	207.5	112.2
Wholesale Prices	116.4	116.5	88.8

Commodity Price Index Advances 31.1 Per Cent From Year Ago

Bradstreet's index of wholesale commodity prices on May 1 dropped slightly to $9.15, a decline of only 0.2 per cent from the April 1 index of $9.16 and a loss of 1 per cent from March 1. The May 1 index, however, shows an increase of 3.6 per cent over the January 1 figure of $8.83 and when compared with the corresponding month of last year, when the index stood at $6.98, reveals a rise of 31.1 per cent.

April Commercial Failures Drop to 1920 Level

Commercial failures in the United States in April, both in number and liabilities, touched another low point. According to the records of Dun & Bradstreet, Inc., failures numbered 1052, for which the total indebtedness was $25,786,975. This is the lowest number of business defaults for any month since January, 1920, excepting only the short month of February this year, when 1049 insolvencies were reported. Liabilities in April, a year ago, totaled $51,097,384.



Number	
April, 1934	1,052
March, 1934	1,102
April, 1933	1,921

Liabilities	
April, 1934	$25,786,975
March, 1934	27,227,511
April, 1933	51,097,384

Some Characteristics Common to

CARBON AND ALLOY STEELS

BY EDGAR C. BAIN
United States Steel Corp.

NEED has long existed for a philosophy of alloy steels which would provide a basis for more orderly and rational arrangement of the varied information on the subject. Even a scientific framework upon which might be supported, so to speak, the classified items of empirical knowledge without inconsistency and irrelevancy would be a great help to the metallurgist.

E. S. Davenport, Dr. R. H. Aborn and the writer, with co-workers, found the reasoning set forth in this paper of some usefulness in work in developing alloys for certain purposes and, acting as spokesman, the writer presents it only as a tentative expression of the basic aspects of the subject as they appear to the investigators.

Evaluation, from the engineering standpoint, of the contributions toward useful steel properties made by the various elements, and their combinations, would be a most desirable service, but the inherent complexities of the problem preclude any hope of such an advanced state of knowledge in the near future. However, it is believed that even now certain generalizations may be made with respect to "how" the alloying elements improve the properties of steel even though "how much" must in many cases await still wider investigations.

From this consideration are omitted the special alloys of iron in which large proportions (for example, more than 4 or 5 per cent) of the alloying elements are incorporated for special purposes, e.g., stainless steel, invar, Hadfield's manganese steel, high-speed steel and others. Primarily the discussion relates to steels carrying upward of one-half of 1 per cent of carbon, sufficient, at least, to insure a marked response to the usual heat treatments applied as a final operation to harden and strengthen the steel.

It is the purpose of this paper to attempt an inquiry into the manner in which alloying elements enhance the properties of steel. The main assumption is that only a few factors determine the final properties of the steels of this class (medium- or low-alloy with medium or high carbon) and that the elements operate to bring about their respective improvements only through their influence upon these few factors. The argument proceeds along lines to warrant the inference that the type-behaviors of all the low-alloy steels are to be found in plain carbon steel, but that in these more nearly pure iron-carbon alloys, certain limitations are inherent which in the presence of additional elements are considerably extended.

As will be seen, these restrictions have to do more with rates of reaction than with inherent properties of iron solid-solutions or iron compounds. The rate of reaction is the principal determinant of the distribution (fine or coarse dispersion) of the two principal entities in steel, ferrite and carbide, which distribution in turn controls in large measure the properties of the steel.

There is no longer any question that physical properties, which may be so widely adjusted by the heat treatments of a single steel, are controlled by the microscopic structure of the final product. In order to develop the particular properties sought, usually high strength with whatever toughness the steel may supply, the first step is a heating above the critical range, wherein the iron is in the so-called gamma form, to dissolve the carbon and other elements combined therewith, forming the solid solution—austenite. This solid

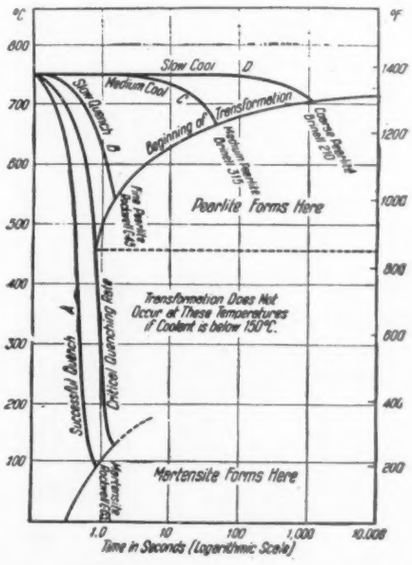


Fig. 1—Influence of cooling rate upon temperature and product of transformation in an 0.85 per cent carbon steel. Time on logarithmic scale

Abridged from a paper presented May 24, 1934, at the meeting of the American Iron and Steel institute in New York. The author, Edgar C. Bain, is metallurgist in the research laboratories of United States Steel Corp., Kearny, N. J.

solution is known to be the material out of which, upon cooling, the desired microscopic architecture is to be built. The first factor to be controlled is the cooling—slow for the softer products and rapid for the harder; the second factor after this cooling is the moderate reheating, (tempering or draw-back) to modify the structure still further, usually applied only to the harder materials. Even though the high-temperature heating may have been required for a rolling or forming operation the actual cooling therefrom is as much a heat treatment as though a separate heating and cooling were provided. In the make-up of the steel as heat treated, there are only four possible constituents:

Relatively Slowly Cooled or Well Tempered Steel

1. Ferrite: Grains of alpha iron carrying some of the alloying element in solution.
2. Carbide: Fe_3C in carbon steels with other elements in solution, or special carbide if the strongly carbide-forming elements are present in sufficient proportion.

Relatively Rapidly Cooled Steel

3. Martensite: Alpha iron with the carbon still in some unstable, unrejected form; very hard, and formed only by low temperature transformation induced by means of a rapid cooling.
4. Austenite: Residual high-temperature solid-solution, not yet fully transformed. Unstable, usually destroyed in tempering; soft and tough.

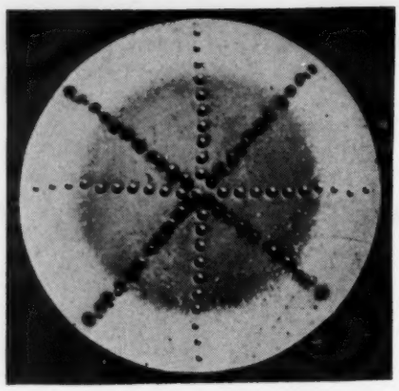


Fig. 3—Section of 1-inch round eutectoid carbon steel quenched in brine. Hardness determinations were made as shown on diameters of the specimen. Note change in penetration at circle representing the critical cooling rate

Few steels, as ready for service, contain other than the first two constituents. In relatively slowly cooled steels, of about 350 brinell hardness or less, only the ferrite and carbide form at all, and they are then distributed in the form of alternate layers or plates, lamellar pearlite; in addition, the hypoeutectoid steels often possess an intergranular network of ferrite. Tempering above 450 or 500 degrees Fahr. usually suffices to destroy martensite and austenite in low-alloy steels, in which case the carbide is spheroidized in minute particles. Only the glass-hard articles retain martensite (or any austenite) and these are not further considered here. In brief, the hardness and strength of the final steel depend upon the state of subdivision of the carbide in the ferrite; the fine carbide dispersions are hard and strong, the coarser dispersions are softer and exhibit more ductility.

It follows then that alloying elements can function principally to improve the physical properties of steel in one or more of three ways:

1. By changing the state of dispersion of the carbide in ferrite.
2. By changing the properties of the ferrite, or
3. By changing the properties of the carbide.

Contributions of Alloys

It has already been suggested that with a certain definite heat treatment a steel containing an alloying element may yield properties very different from those of carbon steel. However, if one wishes to inquire broadly into the overall advantages of an alloy steel, it is necessary to choose the optimum heat treatment for each of the steels, plain carbon and alloy, with respect to the desired properties. If, for example, the familiar combination of high strength and moderate ductility is the desideratum then one might choose a high hardness in the vicinity of 525 brinell and heat treat both steels to this condition and compare the tensile test results.

Many such comparisons might be made with the result that it would become evident that in sections amenable to close control of structure, carbon steel is definitely, though really only moderately, inferior to alloy steels and that, barring the inapplicability of carbon steel to high-strength, heavy cross-sections, it is only this moderate disparity which remains to be explained as the alloy contribution. The failure of carbon steel to develop, in the interior of large sections, the structures which possess high strength depends upon a most important factor called hardenabil-

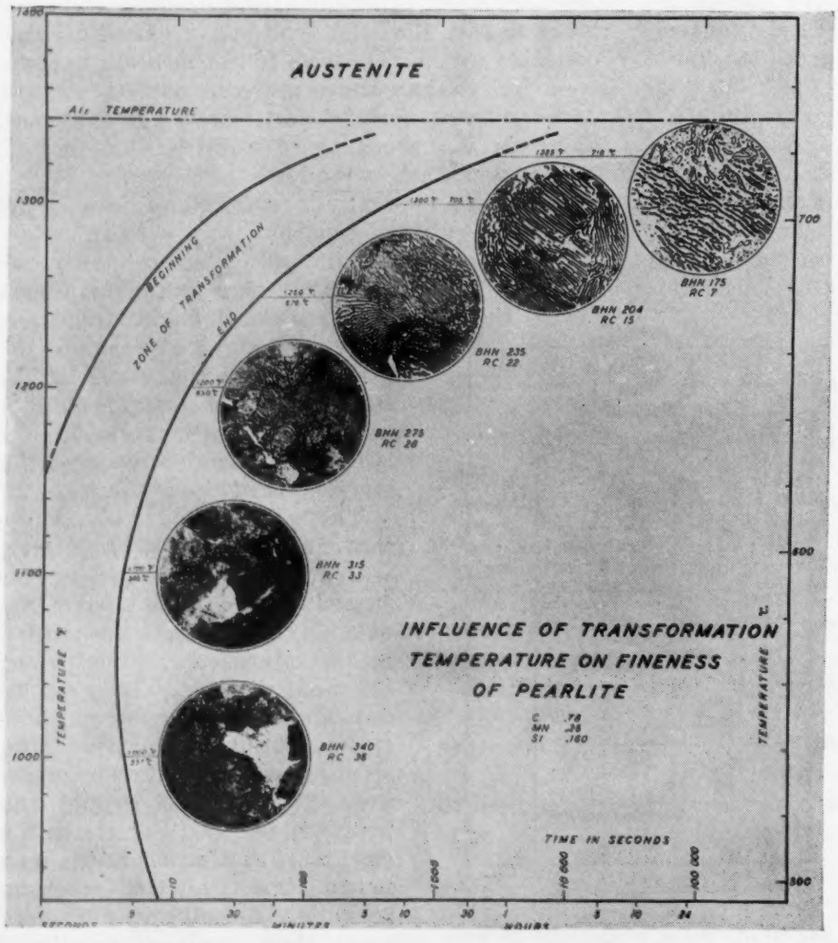


Fig. 2—The transformation lag and transformation interval for a 0.78 per cent carbon steel at various constant temperatures of reaction. The microstructure of the products is also shown at about 750X in present scale

ity and is the basis for much of the demand for alloy steel.

When a carbon or low alloy steel of medium or high carbon content is cooled from a suitable temperature above the critical range, in which the steel is in the austenitic condition, the austenite becomes unstable below a certain temperature and will in time transform to ferrite and carbide. With very slow cooling the transformation begins at a temperature only a little below the maximum at which the transformation is possible, i.e., the true phase-boundary temperature. With increasing cooling rate the austenite undercools to a greater extent. This behavior is directly dependent upon the rate of the reaction,

austenite $\rightarrow$ ferrite and carbide,

as it increases with drop in actual transformation temperature.

The important point here is that the product of the reaction changes consistently with the temperature range in which it occurs. The same two phases, ferrite and carbide, result, but the fineness of the lamellar dispersion changes, and with the refinement in the character of the distribution, the hardness and strength increase. Fig. 1[1], on Page 25, shows how the cooling rate changes the actual transformation temperature of the steel and Fig. 2 shows how the transformation temperature changes the structure and the hardness of the product.

If now another variable can be changed to retard the reaction rate it follows that the same cooling rate should then induce transformation at a lower temperature and cause a harder product to be formed. This is easily accomplished by the introduction of almost any alloying element, such as chromium, into solid solution in the austenite.

When any steel of the class

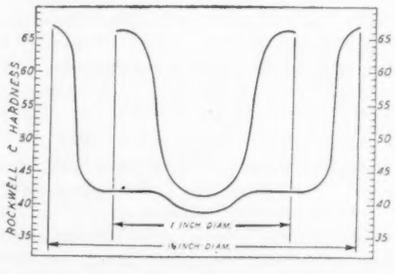


Fig. 4—Average hardness distribution across diameters of two sections of the same carbon tool steel

under discussion is cooled more and more rapidly the direct product is finer and finer ferrite and carbide until the two phases are not even revealed separately by the highest resolution of the modern microscope—but only with respect to certain maximum rates of cooling. Beyond this maximum rate, a still more rapid cooling results in a reaction at a much lower temperature and a quite different product. This product may form only at temperatures below some 250 degree Fahr., and is known as martensite, characterized by great hardness and very limited ductility. The rate of cooling which will just result in the complete transformation of austenite to martensite is called the "critical quenching rate." This is shown in Fig. 1.

A complete series of cooling rates over a wide range is to be found in any sizable specimen of steel cooling in a quenching medium, since portions of metal at the surface necessarily cool much faster than the metal in the interior. If, for example, a 1-inch round section of carbon tool steel is quenched into

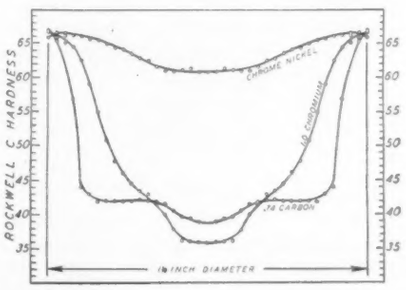


Fig. 5—Deeper hardenability contributed by alloying elements—shallow, carbon steel; medium, chromium steel; deep, chrome-nickel steel

water the outer rim cools in excess of the critical rate and becomes fully hard; the interior cools more slowly and transforms to a fine pearlite in accord with Fig. 1. The martensitic zone is plainly observable on a smoothed section after etching, or hardness measurements may be made across diameters as in Fig. 3. Larger cross-sections of the same steel harden less deeply than smaller sections as may be seen from the hardness plots of Fig. 4.

The important point is that the critical quenching rate is obviously a function of the fundamental reaction rate in the vicinity of 900 to 1000 degrees Fahr. as shown in Fig. 1. Metal cooling faster than the critical quenching rate escapes the austenite to pearlite transformation, and reaches the temperature range for martensite formation, and still unchanged. It follows, then, that the same section of metal quenched into the same medium should harden more deeply if its fundamental reaction rate is lessened by the presence of alloy elements in solid solution.

In Fig. 5 is shown the hardness distribution across the same section of three steels identically quenched. The increased alloy content of the fully hardened section accomplishes the necessary decrease of the critical quenching rate so that even the

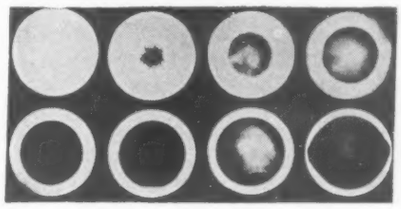


Fig. 6—Sections of hardened 1-inch rounds of 1.0 per cent carbon steels of different hardenability at time of quenching. None contains more than 0.85 per cent total alloy elements

metal in the center, cooling most slowly, is still able to harden.

This is by all odds the most important contribution of alloying elements. Large sections may thus be rendered fully hard throughout, ready for tempering which develops the spheroidal carbide distribution conducive to maximum toughness for any given strength. All elements (with the possible exception of cobalt) even including oxygen, if they are dissolved in the austenite, appear to increase hardenability by influencing transformation rate.

It might appear that only by the addition of alloying elements could the hardenability of steel of a given carbon content be changed, but this is far from true. Carbon itself, of course, is an element which in increasing amounts up to nearly one per cent induces deep hardening, but in the comparisons shown thus far the carbon content has been essentially constant.

It is not necessary to vary even the carbon content in order to change the hardenability of steel. In Fig. 6 is shown a series of 1-inch sections of a number of carbon steel bars of essentially identical analysis (total elements other than carbon under 0.85 per cent). The great range of hardness penetration is evident from the etching effect. The hardenability here was regulated by another factor, austenitic grain size. To be precise, it is impossible to say whether austenitic grain size is itself the determinant of hardenability, or merely an *indicator* of a more subtle factor, which results infallibly in a parallel between grain size and hardenability, other factors being equal. It is convenient, however, and not misleading, to speak of grain size in a steel as controlling hardenability.

Fig. 7 shows the change in hard-

[1]E. C. Bain (Campbell Memorial Lecture), "Factors Affecting the Inherent Hardenability of Steel." Transactions Am. Soc. for Steel Treating, pp. 385-428, Vol. 20, 1932.

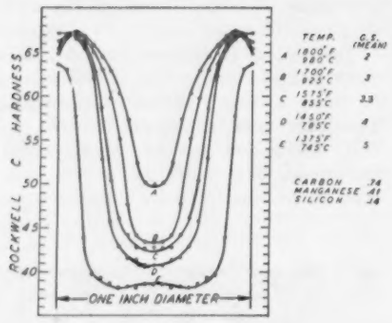


Fig. 7—Change in hardenability effected by increasing the austenite grain size of a carbon steel of 0.74 *per cent carbon. Grain size is controlled by a preheating, although all specimens were quenched from same temperature*

ness penetration caused by establishing a series of increasing grain sizes in the austenite of a single steel. In this case the grain sizes were established by controlled heating as indicated.

Grain size can, of course, be controlled in similar compositions without changing the alloy content through the mode of deoxidation—presumably by "building in" a harmless dispersion of nonmetallic, grain growth-inhibiting particles. Such grain-controlled steels are now on the market. Fig. 8 shows the microscopic structure of two halves of the same experimental heat of 0.39 per cent carbon steel after identical heating and quenching. The structure on the left is coarse-grained and deep hardened (note martensite) while the structure on the right is not hardened at all (pearlitic) and is fine-grained by virtue of carefully controlled deoxidation. In almost all applications the fine-grained steel shows superior performance and it is undesirable to obtain deep-hardening properties by means of causing grain coarsening in the austenite.

Grain growth is restricted also by the presence of stable carbide particles which resist solution at the heating temperature. Such behavior is particularly noticeable in steels carrying vanadium, molybdenum, tungsten, tantalum, and to a marked extent even in chromium steels, all of which elements form carbides which go readily into solution only at relatively high temperature.

If steels carrying these elements in suitable proportion are quenched from the lowest possible temperature which will just cause all the ferrite to become austenite they are often shallow hardening due to:

1. The extremely fine austenitic grain size
2. The low carbon content of the austenite, the carbide being still largely undissolved.

If now, the quenching temperature is raised to a point permitting solution of the alloying element to a moderate extent but permitting at the same time a sufficient residuum of dispersed carbide particles to inhibit grain growth the steel is both fine-grained and deep-hardening. Obviously this result is still better accomplished by the combination of a deep-hardening, non-carbide forming element and a carbide-forming element, or other grain-growth inhibitor. Such steels probably represent the best possible development of strength and toughness, and are exemplified by the controlled-grain intermediate manganese steels.

Higher Internal Stresses

In brief, it appears that the larger austenite grains transform to martensite of poor quality from the standpoint of developing ductility in the moderately tempered product. An explanation[2] has been offered on the basis of higher internal stresses in the product of large grains which seems well borne out by the curious microscopic quenching-cracks observed in coarse grained steel.

Thus far it has been shown that the alloying elements may accomplish a vast change in properties by altering the structure which results from some simple treatment applied alike to the carbon and the alloy steel. The range in properties covered by a single conposition by virtue of controlling the fineness of the carbide dispersion makes this effect of the alloying elements unequivocal. Nevertheless it may well be that, with the same distribution of carbide in ferrite, the alloying element may still manifest its presence by a change in properties. To investigate this point a series of steels of essentially the same carbon content, 0.55 per cent, was so treated as to develop substantially the same structure—a lamellar pearlite of considerable fineness as illustrated in Fig. 9.

In these steels the manganese content ranged from 0.88 per cent to about 6.45 per cent. This selected structure was secured in the various steels by a series of heat-treatments which varied over a rather wide range developed by a "cut and try" method. For example, the low-manganese steel was heated to 1650 degrees Fahr. and quenched into a molten lead bath at 1255 degrees Fahr. where it was held at constant temperature 20 minutes for full transformation. To secure equivalent structure, the high manganese (6.45 per cent) steel had to be cooled from 1650 degrees Fahr. into a constant-temperature bath at 960 degrees Fahr. for transformation which required 420 hours for completion.

Change in properties caused in the same structure by the increasing manganese content is definite, but very moderate.

By way of contrast, the effect of the same identical heat treatment upon each of a series of chromium steels of like carbon content was noted in tests. The fact that the influence of the alloying element is

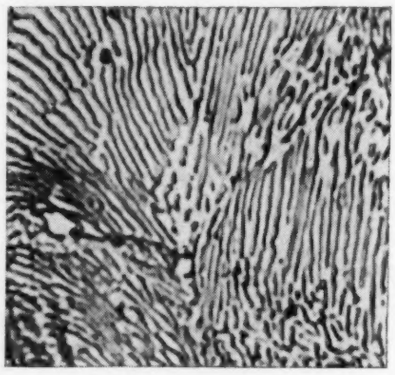


Fig. 9—Photomicrograph of the representative pearlite structure developed, alike in four 0.55 *per cent carbon steels with respectively* 0.88, 2.21, 3.72 *and* 6.45 *per cent manganese.* 3000*X*

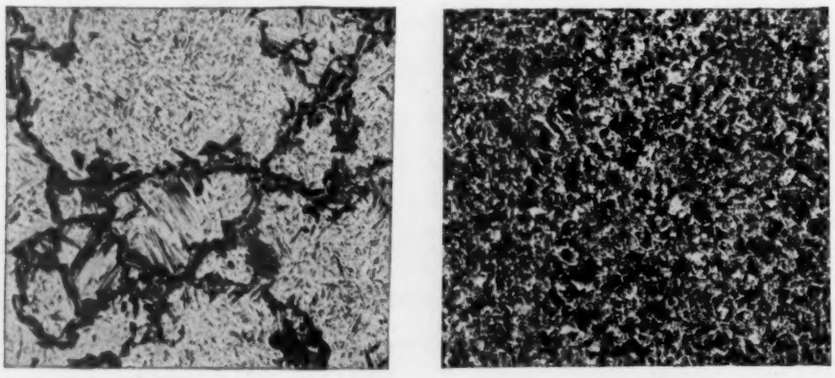


Fig. 8—Effect of grain size control in steelmaking upon a quenched 0.39 *per cent carbon steel heat; left, coarse-grained, unkilled; right, fine-grained, aluminum-treated steel. Microstructure at* 100*X of interior of quenched bar*

[2]E. S. Davenport, E. L. Roff, and E. C. Bain, "Microscopic Cracks in Hardened Steel, Their Effects and Elimination." Transactions Am. Soc. for Metals, p. 289, Vol. 22, April, 1934.

primarily through the control of reaction rate and attendant structure is well established, and further corroborated by an examination of similar structures in a chromium series with respect to tensile properties. In the case of the chromium steels the actual amount of carbide may not be precisely constant with increasing chromium even though the carbon content is the same, for at some concentration of chromium and carbon the carbide is no longer of the Fe_3C type and, instead, is considerably more voluminous. Nevertheless, with constant carbon and equivalent structure the property change is slight.

Up to this point the argument has brought out, first, the profound influence of alloying elements in determining structure, assuming a single cooling schedule, and second, the relatively minor influence exerted in a single structure type through a change in the properties of the ferrite matrix. Occasion has already arisen to mention the peculiarities of the carbide formed in the presence of certain of the elements. This factor becomes of considerable importance in the quench and temper treatment employed to gain the higher strengths.

Carbides Coalesce in Tempering

It is well known that some of the hardened alloy steels—particularly those containing considerable proportions of the strongly carbide-forming elements molybdenum, tungsten, vanadium, titanium, and chromium require higher tempering temperatures in order to reduce the hardness or strength to a predetermined value. The softening of steels during tempering is involved almost exclusively with the coalescence of carbide particles to such average individual size as is relatively ineffective in contributing hardness and strength to the steel.

In freshly-formed martensite the carbon is in some precipitation state (as atomic or molecular dispersion); reheating promptly initiates the particle growth which results in softening, but after the first few minutes at temperature the softening is extremely slow. Intervals of one or two hours are customary since this period probably accomplishes at least 95 per cent of the softening which even several days at the same temperature would bring about.

The softening rate is controlled by the rate at which the carbon diffuses through the ferrite matrix. Since many of the alloy steels soften less markedly than carbon steels with the same tempering treatment it must be concluded that the diffusivity is lower in the presence of the special elements. Strictly speaking, diffusivity is as much a function of the matrix through which the carbon and the carbide-forming element diffuse as of the carbide itself; it is convenient, however, to regard the diffusion as a carbide property and no difficulty arises from this concept.

Nickel content exerts little influence on the tempering of the steel; it is almost wholly present in the ferrite phase and hardens the ferrite little indeed. Silicon is likewise an element which does not incorporate itself in the carbide phase but is a fairly effective solid-solution hardening element in ferrite.

The effect of chromium to retard carbide coalescence is quite marked. It is effective in moderate proportion up to temperatures of about 850 degrees Fahr. but at higher temperatures softening is not so greatly hindered. The extraordinary effect of tungsten-bearing alloys (all of 0.55 per cent carbon content) to resist the softening effect of tempering has been shown by tests.

More recent investigations indicate that molybdenum, at least in moderate concentration, is as effective as tungsten in this respect. It is scarcely possible that there is no relation between these observations and the fact that molybdenum, tungsten and chromium are carbide-forming elements and that their comparative capacity for attracting the carbon of alloys is in about the order named.

Since the proportion of the carbide-forming element in the ferrite is relatively low in high-carbon steels, one may pressume that the matrix is about the same in the various steels. Yet the alloy steel may be as strong as the carbon steel after a relatively much higher tempering temperature by virtue of the finer carbide dispersion. The relief of the internal stress originally in the martensite depends upon the tempering temperature. One may infer, then, that residual stress is lower in the alloy steel than in the carbon steel at the same hardness. One principal cause of low ductility and low impact strength is internal stress upon which the externally applied stress is superimposed during test. If a higher tempering temperature may be applied with its attendant lower residual stress, the greater will be the toughness which will result at comparable hardness. Through this fundamental characteristic of carbide-forming elements to reduce diffusivity, it seems that the improved toughness may, at least in part, be explained.

This carbide behavior of the alloy steels may have an important bearing upon creep strength. The creep strength cannot possibly ever exceed the room-temperature tensile strength which results in a metal after tempering at creep temperatures; a metal which resists permanent softening at creep temperatures has the chance, at least, of resisting creep likewise. Molybdenum, particularly in conjunction with certain other elements has contributed excellent creep resisting qualities.

The fine-particle method of securing high strength which is exemplified in all tempered steels of the class under discussion invariably accomplishes its purpose with some concomitant loss of ductility. A more feeble strengthening effect is that of elements in solid solution, but in general this type of strengthening is accompanied with less loss of ductility. Thus the elements such as nickel, cobalt, and silicon which make their presence felt through their influence upon the ferrite are sometimes called toughening elements, although silicon must not be present in very great concentration. These elements too, however, contribute chiefly through their effect upon reaction rate and hardenability.

"Pure" Carbon Steel Tested

In view of the evidence that small proportions of some elements produce relatively large changes in properties it may perhaps be averred that there is no medium- or high-carbon steel manufactured—that all commercial steel is alloy steel. Considering the silicon and manganese content of most steels, excluding the low-metalloid, open-hearth irons, no fitting rejoinder to this accusation may be made.

Indeed, those elements which are employed in making carbon steel, not intentionally for their contributions to physical properties, but as aids to sound steel production are still most important, for in many cases in the course of their deoxidation action they contribute minute nonmetallic particles. It is perhaps fortunate that little, if any, pure carbon steel has ever been made. To satisfy a strong curiosity and to prove certain predictions the writer and his associates, did, in point of fact, make small specimens of extremely pure iron-carbon alloys by means of oxygen-free cementation of hydrogen-purified electrolytic iron of exceptional purity. In brief, this "pure" carbon steel gave evident of an A_1 point somewhat higher than any commercial carbon steel and possessed the highest rate of reaction yet observed under like conditions.

The outstanding characteristic,

(*Please turn to Page* 36)

Technical Committee Studies Specifications for Steel

BY L. S. MARSH
Inland Steel Co.

THE Technical committee of the American Iron and Steel institute was appointed on Dec. 14, 1933, and, at an organization meeting held in Pittsburgh in January, a permanent chairman was selected, the work outlined and 12 subcommittees appointed.

In considering the work of the committee, it was apparent that the most pressing subject would be a thorough study of the various sections of the book of "Uniform Extras and Deductions for Products of the Iron and Steel Industry under the Code of Fair Competition." This study was considered necessary to correct errors, change phraseology where the intent might not be clearly understood, and make such additions as seemed necessary for a clearer understanding of the details, particularly with reference to qualities, grades and specifications.

Each of the 12 subcommittees acts as an informative group in connection with specific product classifications; for example, semifinished, bars, plates, tubular products, etc. In nearly every case, chairmen of these subcommittees are also chairmen of permanent committees handling similar products in the Association of American Steel Manufacturers' Technical Committees, from which organization, the personnel of the Technical committee was drawn.

Formed Four Decades Ago

The Association of American Steel Manufacturers was organized nearly 40 years ago. The resolution which served to form this group, as taken from the records, reads as follows: "Resolved, that a permanent organization be hereby formed to meet from time to time to discuss matters pertaining to the manufacture and use of steels." Certainly a broad field to cover but, as events proved, none too broad for the purposes of the organization thus begun.

The resolution plainly states the foundation on which all of the association activities have been based. These activities have been and still are representative of much pioneer work in the standardization of metallurgical and technical practices employed in the manufacture, rolling and finishing of general commercial steel products in this country.

One of the first jobs undertaken by the new organization was the standardization of specifications for structural and open-hearth plate steel which included the first standard rolling tolerances for plates. The value of this pioneer work is evidenced by the fact that these tolerances, revised to provide for improvements in manufacture, have remained to the present time generally acceptable to both buyer and manufacturer.

Sections Are Devised

The Association of American Steel Manufacturers developed the first standard sections for beams, channels and angles known as "American Standard Sections" which were uniformly adopted by the American mills.

Other activities of the association may be briefly mentioned, as follows:

Standardization of tests for eye bar flats based on tests of material rather than on full sized eye bars. Agreement that the tensile strength stamped on boiler plates should be the guaranteed minimum.

The adoption in 1903 of a single grade of structural steel, with a tensile range of 55,000 to 65,000 pounds, instead of two grades with tensile ranges of 52,000 to 62,000 pounds and 60,000 to 70,000 pounds. This is representative of a type of standardization which is extremely valuable to both user and manufacturer. In this connection, mention should also be made of the co-operation of the association with the American Society for Testing Materials, during the past two years, in developing specifications for a "Medium Grade Structural Steel" with a tensile range of 60,000 to 72,000 pounds per square inch. It is expected that this new grade will gradually replace the present standard specification material.

Adoption of standard permissible variations in the weight of bar size angles.

Adoption of standard permissible variations in the size of hot-rolled rounds, squares, hexagons and flats.

Standard specifications for concrete reinforcement bars, standard specifications for open-hearth steel blooms, billets and slabs for forging purposes. Standard methods of sampling for check analysis.

Development of the standard specifications for boiler and firebox steel.

Co-operation with the A. S. M. E. Boiler Code committee, resulting in the adoption of specifications conforming to standard practice.

Adoption, in 1917, of a grade of steel known as "pressing steel."

During the past two years the association has published tables for cutting and rolling tolerances for bars, tables of permissible variations for gage, flatness, camber, width and length for plates over 2 inches in thickness and has been largely instrumental in developing standard specifications for tubular products. The standard chemical ranges and allowable variations therefrom, as established by the association, were promulgated and generally accepted before the advent of the "Code."

For a number of years past the Rail committee has been giving full co-operation to the American Railway Engineering association in connection with specifications and special tests of rails in service. Present specifications for rails, tie plates and spikes are the result of joint committee work between the A.R.E.A., A.A.S.M.T.C. and A.S.T.M.

The association has always worked in concord with the American Society for Testing Materials and while the association has in the past promulgated numerous specifications for steel products, at the present time its policy is to refrain from specification writing, except by co-operation with other organizations. It believes that its activities will be of greater benefit to the industry if confined to studying the many variables covered by existing specifications, to standardizing mill tolerances for commercial and special products, and the rationalizing of chemical and physical requirements in order that they may conform with accepted mill practices.

Identity Is Changed

In 1930 the name of the group was changed to "Association of American Steel Manufacturers' Technical Committees," in order to indicate more clearly the purpose and activities of the organization.

The foregoing is cited to show the background of the Technical committee, the members of which have been active in the affairs of the A.A.S.M.T.C. Most of them are chairmen of standing committees and three are past presidents of the association.

Time has proved that the program outlined at the organization meeting was sufficiently comprehensive to

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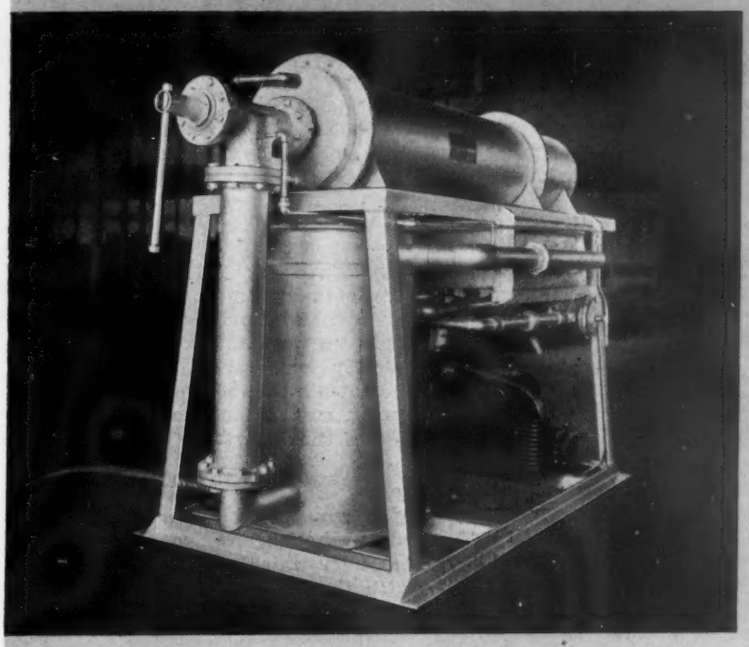
Presented May 24, 1934, at the meeting of the American Iron and Steel institute, New York. The author is manager, department of inspection and metallurgy, Inland Steel Co., Chicago.



SC Standard DX gas preparation unit which supplies controlled atmosphere gases to muffle of heating furnace. Standard size units are available in capacities from 500 to 15,000 cubic feet per hour.

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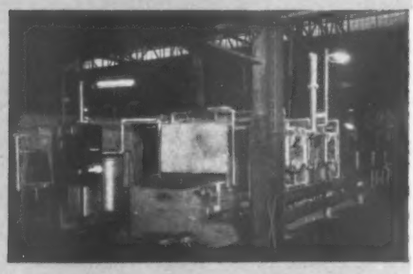
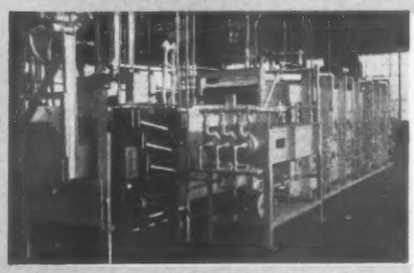
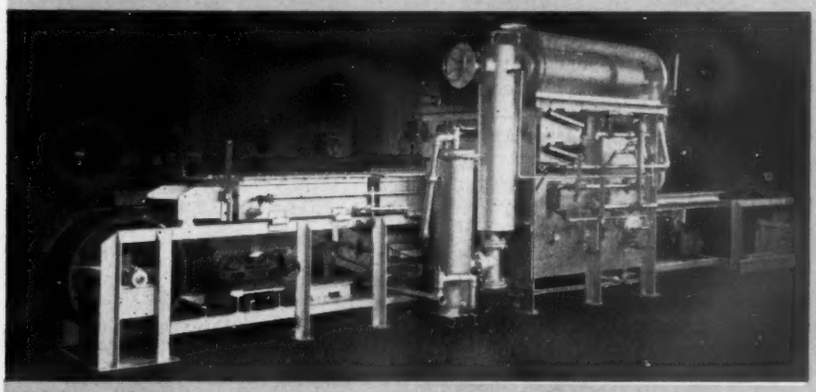
The Surface Combustion DX Unit for preparing gas used for bright annealing is now available for use with existing furnaces such as box annealing, etc. Many of these units are in use producing dependable and economical gas for controlled atmosphere furnaces.



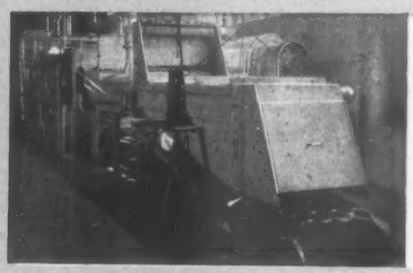
Steel Wheel Stampings are bright annealed in this SC controlled atmosphere furnace at greatly reduced production costs.



SC Controlled Atmosphere Furnace for heat treating cam shafts.



Continuous belt type muffle furnace for annealing steel and brass bearing parts.



Continuous belt type muffle furnace for bright annealing copper and brass tubing in straight lengths and coils.

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keep the committee busy. Many of the members have devoted a large part of their time to the work; and at its first regular meeting, held Jan. 12, the committee was advised that it would be expected to make a thorough study of "Extras," from a purely technical standpoint. We realized then, that a real job confronted us.

The first part of the program has been fairly well covered, recommendations having been submitted to the Administrative committee of the Institute for a total of 20 sections as now shown in the book of "Uniform Extras and Deductions." Certain sections have been less thoroughly studied than others solely because of lack of time. Some of the sections were drafted several times before they were considered suitable for submission but this does not mean that these are perfect, possibly far from it.

Recommends Uniform Interpretation

Competition should be based on the technical details of a specification and certain requirements in a specification calling for a definite quality of material should be interpreted by all manufacturers in the same manner. I believe no one will take exception to this. There have been numerous specifications which call for a restricted tensile range and it needs no argument to indicate that where such restricted ranges are required an additional manufacturing hazard is involved. Other specifications stipulate chemical ranges which cannot be met or, if possible to do so, only with extreme difficulty. Much of the time of the committee has been given to studying such types of specifications with a view to eliminating unreasonable requirements, or by establishing a standard procedure, avoiding the troubles which have resulted from specifications of this type.

In carrying out the first part of the program, the committee endeavored to harmonize the various sections, particularly with reference to chemical ranges and requirement. On first thought this appeared to be fairly simple and easy to accomplish but as the work progressed, many instances were encountered which did not permit such treatment. It was found that users of wire and wire products were accustomed to different chemical ranges than those set up for bars and semifinished; likewise, the requirements for plate material could not be standardized with other products as completely as seemed desirable. The numerous instances of this nature which were brought to light convinced the committee that more harm than good would result from any attempt to hold too rigidly to a standardization ideal which, while highly desirable from a technical standpoint, might be objectionable to users of many products.

With the exception of some special products, certain commodities covered by definite specifications and some standard specifications, the chemical ranges as now shown in the section on Semifinished Steel are applied throughout the various sections of the book. The committee has recommended that the "Manufacturers' Standard Limits in Chemical Composition* * *," "Manufacturers' Standard Permissible Variations on Check Analysis," and "Manufacturers' Standard Methods of Sampling for Check Analysis," be placed as an appendix in the book instead of being shown in each of several sections.

The use of phraseology so definite as to permit no other interpretation than that intended has been no small problem for the committee. It has been conclusively shown that "intent," particularly where extras are involved, has no weight unless so clearly indicated that misinterpretation is impossible. This is well illustrated by the following example:

Included in the "Extras for Chemical Specifications" as set up in the section on bars, are those for varying ranges of manganese. A note under the list of such extras reads as follows: "When the mean of the range agreed upon is above 1.15 per cent the extra shall apply only to steel with maximum carbon specified 0.20 per cent or higher."

Intent Is Clear

To the steel manufacturer, the intent in this statement is perfectly clear, meaning to him that a carbon content *lower* than 0.20 per cent cannot be specified with the stated manganese range for the extras shown; the intentional misinterpretation of the above note assumes that, for any carbon *under* 0.20 per cent the note does not apply and an extra may or may not be assessed, depending upon expediency. Low carbon high-manganese steels cannot be made except by the use of a special ferromanganese, practically carbon-free, the cost of which is much greater than that of the standard ferroalloy ordinarily used. It will be readily understood that a change in the "note," or an addition thereto would become necessary and the Technical committee therefore recommended phraseology which clarified the intent and an increase in the extra commensurate with the increased cost of production.

This instance is typical of many which demanded the attention of the committee and it is quite possible that statements still remain which are not sufficiently clarified to be entirely free from possible misinterpretation.

The question of manufacturing cost differentials which is reflected in the established "Extras" appears to be the subject of a great deal of misunderstanding and, from some quarters, severe criticism. Extras are pretty well understood by the experienced steel buyer, but to those not familiar with the purchase and use of steel and, to some extent with its manufacture, extras are sometimes open to suspicion.

While the Technical committee has not completed its study of extras, considerable information has been obtained and this phase of the work will continue until the data secured on various products are sufficiently comprehensive to permit the compilation of average manufacturing cost differentials representative of the industry.

Procedure to Be Studied

It may be well for us to give some thought in considering the basis on which extras are assessed, with the idea of bringing out definite points with the hope that such clarification of the subject may help to give both the layman and the buyer a better understanding of the subject, and to alloy as much as possible the tendency toward unfavorable criticism from uninformed sources.

In considering manufacturing cost differentials, the Technical committee has no interest in the base cost of ingots except as this may be influenced in the chemistry and open-hearth practice involved. However, immediately with the changing of the ingot into some other product, certain definite costs are incurred. Such costs, continuing through each conversion, must be taken into account and reflected either in the base price or through the application of an extra.

As a base price product on which we are justified in building our extras, we may consider that which is produced at a minimum cost with the greatest production rates. The user of bars, which are produced without pickling and chipping of billet, should not be expected to pay for such refinements where a lower grade material will answer the purpose. Likewise, a wide variety of products made from bars necessitates the pickling and chipping of billets and a heavy discard. Certainly the user of this class of product should pay an extra for the greater demands which he makes upon the material.

The buyer of plates used in the manufacture of a product requiring a surface practically free from defects, because of the kind of finish put upon the fabricated product, should understand that much greater preparation of slabs is required than would be the case were the plates to be used in fabricating ordinary tanks. This means, for the higher class product, that slabs must

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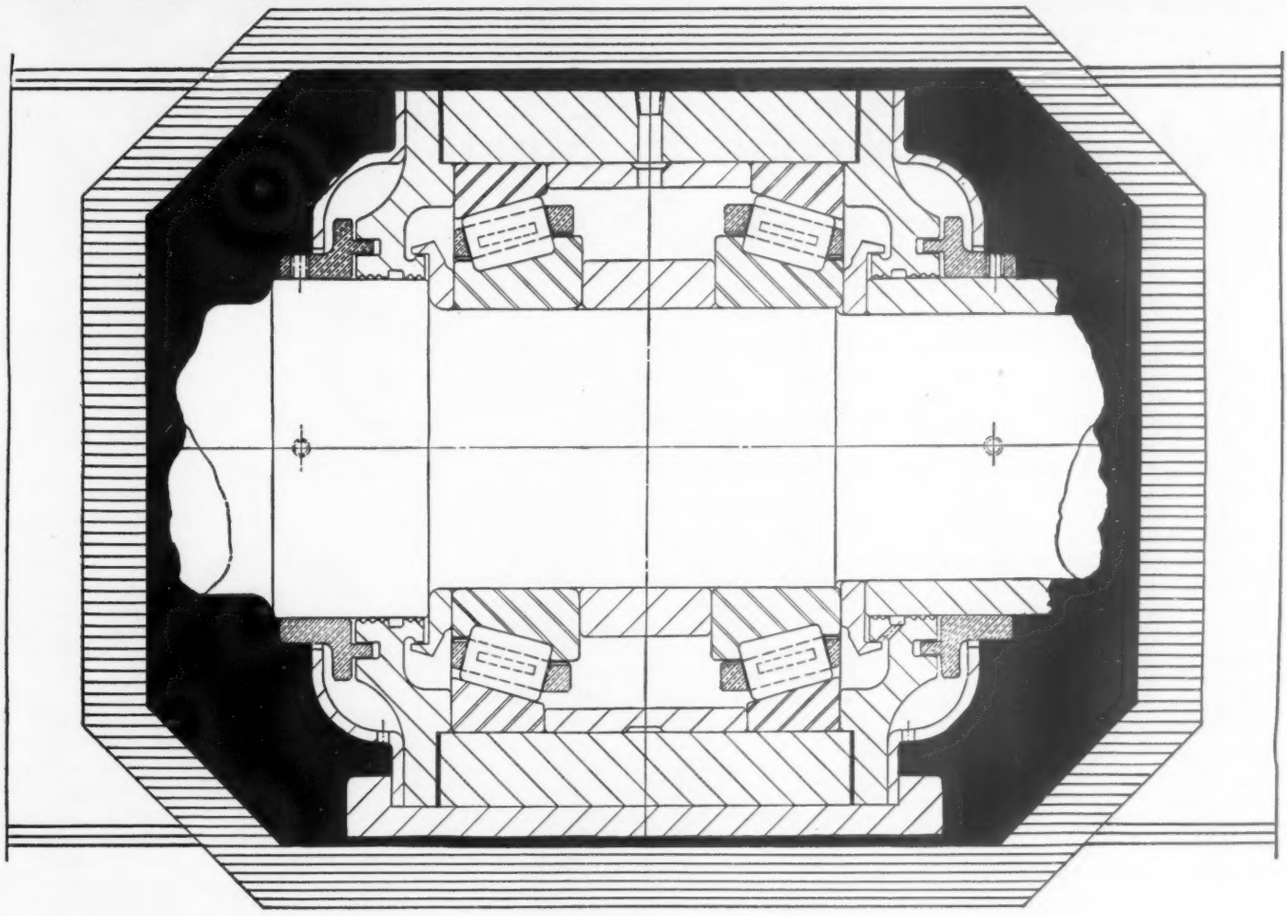

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be "laid down" and chipped for the removal of surface defects. Here we have definite labor costs added to the mill slab cost and what could be more logical than asking the buyer of the more highly refined product to pay an extra for such requirements?

Sheet products, because of the multiplicity of uses, the demands for physical qualities which permit extremes in deformation, surfaces which will permit highly polished finishes and extremely close gage requirements for certain types of die operations, present a classification that requires the application of extras in order to carry on business with any possibility of fairness to both buyer and seller. Specifications requiring close chemical limits mean that additional cost is entailed, not only because of the greater difficulty in properly making the heat in the open-hearth furnace itself but also on account of the hazard involved from "off-heats." There are numerous specifications in which the chemistry demanded is within such a range that, when the heat made for application against the order fails to come within the specified range and is, therefore, an "off-heat," there may be no outlet for the steel.

Specifications which demand close physical limits can be met only at an increased cost and both the re-

(*Please turn to Page* 42)

Welding's Challenge to Steel

BY EVERETT CHAPMAN
Lukenweld Inc.

IN TRAVELING around the country in the interest of welded steel construction, two major impressions are outstanding. First, the woeful lack of knowledge of steel on the part of the average user, and second, his tremendous curiosity concerning the nature of steel.

In steel he has a material possessing a set of physical characteristics unmatched by those of any other material—characteristics that can be flexed and molded to meet the most stringent conditions. Does he want the stiffest material that is commercially available? Does he need unsurpassed strength at some point? Does he need a material that he can repeatedly beat upon, something that he can abuse? Does he wish to absorb energy? The answer of the steel industry to date has been largely, "Just get some rolled steel."

Education Is Needed

But the answer has not been sufficient to elevate steel from the commodity class in the consumer's mind, for the simple reason that the consumer has not been taught the manipulation of the properties of steel which results in the superb performance of which steel is capable under the severe demands of present-day industrial duty. The consumer does not realize that rolled steel, despite its low base price of less than two cents a pound, offers him the very properties that he so often seeks in materials at far higher price. The glamorous romance of steel that could have such an appeal to the consumer has been dimmed and buried by two facts, its price, and the apparent unwillingness of the steel industry to talk very much about anything else except price.

The consumer has had to be his own teacher and what he knows of the use and abuse of steel has been learned principally in the hard school of experience in the grim shadows of tradition. In applying welded steel construction to the consumer's real needs, it has been found necessary to discuss such fundamentals as modulus of elasticity and deflection phenomena; fatigue characteristics, endurance limits and the mechanism of fatigue failures; carbon content and general chemical analysis as they affect the thermal abuse administered to steel when welding or flame-cutting it; impurities and the segregation of impurities as they affect the weldability of steel; open-hearth chemistry and the structure of open and killed ingots as they respectively affect the soundness of the resulting rolled product; rolling operations; heat treatment and stress relief of resulting structures; contraction phenomena of the weld metal and their relation to locked-up stresses; the effect of locked-up stresses upon the subsequent service behavior; and a multitude of other technical details and ramifications, all of which the consumer finds utterly fascinating and which are vital to his intelligent use and engineering appreciation of rolled steel. Those things that one knows and understands are first in our esteem. It would seem that the picture that welded steel can present to industry is the perfect medium for the dissemination of the information the steel consumer needs and desires.

The picture is broad. It is pretty well established in the minds of some few people at least that the limit of the possibilities of the welding method of construction is only that imposed by the engineer's imagination. Properly used, the process allows an engineer the freedom to function as an engineer, since the inhibitory restrictions of the old established practices are absent. It constitutes a tremendous challenge to the engineering profession in that it presents a perfect tool with which to integrate an assembly of steel units into a whole. Its magnificent potential appeal to the most fertile field for steel's promotional work is the implied challenge to the steel industry.

Judging by the content of many interviews and interest at the various meetings around the country, users of steel and potential users of steel are voracious for information on steel for welding, welding methods, and welding design. To date, everyone interested in the welding process has participated in this development but there has been no organized participation by the steel industry, which can probably gair more through the advancement of welding than any other group, not merely in direct tonnage gains but in an opportunity to present steel as an entity, with a personality, on a stage which can be set for it with its own properties, in strict conformity with the most modern methods of marketing.

High Physicals Shown

Aside from the marketing angle, the welding development carries another challenge to the steel mills. Modern weld metal is a freak metal. It is freakish in that similar physical characteristics cannot be produced in the open hearth today. Compared with open-hearth steel of the same chemical analysis, it shows markedly superior physical characteristics. At a carbon content of from eight to ten points, it will exhibit a tensile strength of 65,000 pounds per square inch. At that tensile strength, it will show a degree of ductility as measured by 35 per cent elongation in two inches

These figures can hardly be reconciled with the properties of any mild rolled steel that we know today, and they become more surprising when it is realized that this material shows these properties in the cast condition. A cross-section through a weld made in one pass shows an obvious columnar type of crystallization. Correlative properties such as impact values, endurance values and corrosion resistance show values which are also out of

Presented May 24, 1934, at the meeting of the American Iron and Steel institute, New York. The author is vice president, Lukenweld Inc.,division of Lukens Steel Co., Coatesville, Pa.

ARE YOU STARTING RIGHT?

At every step we ask:

"Which *method* will make the *best* **TOOL STEEL?**"

AT every stage in the manufacture of Bethlehem Tool Steels there's just one basis for determining the process to be followed. The answer to the question, *"Which method will make the best tool steel?"* solely decides the equipment and method that we use.

This policy has led to adoption of the following processes, which are outstanding features of practice in the Bethlehem Tool Steel Plant:

HIGH-FREQUENCY INDUCTION MELTING: Bethlehem Tool Steels get the right start by melting steel to laboratory in the high-frequency electric induction furnace, which makes standards of accuracy.

LIBERAL INGOT DISCARD: Large discards, from both the top and bottom of the ingot, mean that the buyer gets only the "cream" of the tool steel.

HAMMER-COGGING OF INGOTS: It's far costlier to hammer-cog ingots than to roll them. But the tremendous impact developed under the 14,000-lb. hammer insures a complete working of the entire ingot and the breaking up of all undesirable ingot structure.

PROGRAM-CONTROLLED ANNEALING: The exact heating, soaking and cooling curve desired is obtained by a motor-driven cylinder on which the edge of a plate guides the temperature regulator. Possibilities of human error are eliminated.

RIGOROUS INSPECTION: Thoroughly representative cross-sections for inspection are obtained by cutting slabs from the tool-steel billet stock before rolling, and cutting discs from the finished bars . . . These samples are subjected to hot-acid etch, hardenability tests and microscopic examination.

Bethlehem Steel Company, General Offices: Bethlehem, Pa.

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the ordinary for material of this analysis and structure.

Here is a material in a condition which, by all the tenets of the usual metallurgy, should exhibit properties inferior to the product of the rolling mill. It is believed that the seat of these extraordinary values lies in the extreme cleanliness of the weld metal as deposited by modern welding techniques which protect the fusion deposits from the atmosphere. The endurance value of this cast material, which should show directional weaknesses, is in the neighborhood of 30,000 pounds per square inch and this exceeds the values as exhibited by the product of the open hearth.

Cleaner Steels Show Best

Some time ago, various specimens of steel were broken under the microscope, which specimens were purposely made with different degrees of oxide inclusions, and the mechanism of their failures was observed microscopically. It was interesting to note that the grains of the cleaner steels developed a marked number of slip bands under load before failure. In contrast, the more oxidized steels failed through the grain boundaries before the grains themselves developed any slip bands. The more finely divided oxides in the oxidized steels were found to have been excluded to the grain boundaries which effectively isolated the grain elastically to a point where the breaking load was not high enough to deform plastically the material in the grain.

Some place in this conglomerate picture that modern weld metal presents would seem to be a clue that steelmakers could well afford to investigate in their search for better steels. Today, the situation presents a picture in which the modern fusion deposits which can be used for joining rolled steel products have characteristics and physical properties which are superior to the material they join.

To sum up, the physical properties of these modern weld metals with respect to the mild steels they join and, what is more important, to the higher strength alloy steels in conjunction with which they can be used, offer a challenge of considerable magnitude to the open hearth practices of today. Modern engineers, engineers with imagination, have at their disposal, if intelligently used, a material surrounded by a commercial technique which can sew together and integrate a mechanical structure from a series of composite pieces of rolled steel material to meet service conditions in accord with the next step in industrial revolution.

Aspects of Carbon and Alloy Steels

(*Concluded from Page* 29)

however, was its extraordinary capacity for grain growth and microscopic quenching cracks. Reasoning along the lines already set forth here these properties were predicted as necessarily characterizing such a pure iron-carbon alloy; had it behaved otherwise, then considerable doubt would have attached to the present concept. For such purposes as are usually contemplated the pure carbon steel appeared to be very inferior indeed.

With rather more truth and less humor than was intended, one of the investigators remarked that if large quantities of pure iron-carbon material were commercially available, the first task would then be the judicious introduction of some properly selected dirt.

It should now be possible to carry out the original intention to reduce the number of factors in the influence of alloying elements to a minimum. It has been shown that the alloying elements function so as to accomplish one or more of the following:

1. Increase hardenability. Upon this effect depend the development of high strength throughout the whole of large sections, the development of higher strength by simple cooling and the overcoming of the shallow-hardening tendency of beneficial fine grain size. Manganese, silicon, chromium, nickel, molybdenum, tungsten, all contribute to deep-hardening by retarding the transformation rate in about the order named, but only in so far as they are in solution in the austenite at time of quenching. Carbide-forming elements dissolve slowly and only at the higher temperatures.

Hardenability and Toughness

2. Retain fine-grained austenite. Upon this effect depends not only to a great extent the hardenability of any single composition but, what is more important, the toughness of its harder structures. Grain growth is inhibited by the undissolved special carbides of vanadium, titanium, zirconium, molybdenum, tungsten, and chromium (somewhat in the order named). The oxide compounds of aluminum, zirconium, vanadium, titanium, and silicon if in persistently fine particles, likewise retard grain growth and thereby bring about the influences mentioned above.

3. Retard softening during tempering. Upon this effect depends the possibility of employing higher tempering temperatures for a given strength, lessening residual internal stress and improving thereby ductility and impact strength. The creep resisting property of a steel probably depends likewise upon this preservation of a fine dispersion of carbide particles. Red hardness is the result of this influence in high degree. The same carbide-forming elements exert this effect as were mentioned under (2), but only as dissolved in austenite and not as dissolved in ferrite.

4. Strengthen the pure ferrite matrix itself. Upon this effect of solid-solution hardening depends a method of moderate strengthening without loss of ductility. Nickel, silicon, manganese, cobalt, aluminum (as alloy) and possibly chromium function in this manner but only in so far as they are dissolved in ferrite and not incorporated in carbide.

Refractory Maker Improves Chromium Base Cement

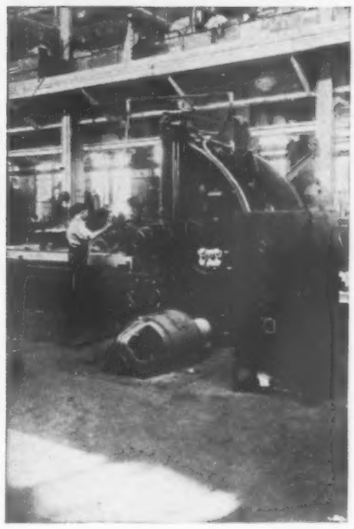
An improved chrome-base refractory cement now is being marketed by Botfield Refractories Co., Philadelphia. Component materials will not settle in the drum or mortar box but will remain in suspension indefinitely, it is stated. Known as Adachrome Super-Cement, the material is workable on insulating brick and develops a strong air set in a short time after application without requiring heat.

The bond of the material is attained by reason of practically zero shrinkage, a crystalline structure and a nonsilicate binder. Hence, it is nonfluxing and nonglazing even at the higher ranges of temperature, and is said to remain strong even under load at high temperatures. Tests show a pyrometric cone equivalent of cone 38, which corresponds to a temperature of 3335 degrees Fahr. No expansion is shown at the highest temperatures.

The product is chemically neutral and highly resistant to chemical reactions. It is said to be impervious to the attack of most slags, resistant to coal ash and other fluxing ingredients in fuels, to retard erosive and corrosive actions and to prevent penetration of molten metal.

Dipped or troweled joints in laying up firebrick and surfacing work are some of its uses. When mixed with Adachrome grog or similar material, the cement is adaptable for patching work, the making of furnace hearths, or other monolithic refractory construction. In conjunction with fire clay, high alumina, silica, chrome and magnesite brick, the product is suitable for all types of boiler and industrial furnaces where temperatures are fairly high or where chemical reactions are encountered.

Making the Most *of* METHODS AND MATERIALS



Alternating Current Used To Apply Rustproofing

An alternating current process for electroplating sheet metal parts with a rustproofing and receptive foundation for paint, lacquer or enamel recently has been placed in commercial production. The coating is tri-zinc-phosphate about 0.0005-inch thick, smooth in finish, the utility of which depends upon the virtue of being chemically insoluble and thus impervious to the action of moisture. Because of the electrolytic action in the bath, the coating is said to be continuous and without pinholes.

The process, said to be fool-proof, uses current of commercial frequencies and voltages; direct current cannot be used. Its economic value is said to lie in the fact that work is coated in a 3-minute cycle, using a current density of 110 ampere-minutes per square foot of surface. One gallon of the preparation used in the process, it is claimed, will coat approximately 2000 square feet of metal and the total cost of current and chemicals will run well under 25 cents per 100 square feet of the surface coated.

Operation of the bath is said to be extremely simple, requiring only occasional titration to determine its composition, principally to ascertain when more of the basic chemical is needed.

\$ \$ \$

A large knitting company recently experimented with hardsurfacing on wearing surfces of stitcher cams, the ordinary life of which is one month. It was found that the worn cams could be built-up with stellite for about one-sixth the cost of new ones and would last for six months. By re-application of the abrasion resisting alloy, the cams are made to last indefinitely.

\$ \$ \$

Heat Treated Cast Iron Gives Good Die Service

A heat treating cupola cast iron produced by a midwestern company is finding successful use in draw dies; it also is said to give excellent service in stamping light-gage metal on short runs. Composition of the iron is: Nickel, 2.00; chromium, 0.75; total carbon, 2.90; silicon, 1.50; phosphorus, 0.10; manganese, 0.75; and sulphur, 0.90 per cent. The material is readily machinable as cast and usually is molded in dry sand so that it can be cast very close to size. After being machined, it is subjected to the following heat treatment: Heat to 1550 degrees Fahr.; hold 20 minutes; quench in oil; draw at 300 degrees for 1 hour.

No difficulties have been encountered with the cracking of this material due to heat treatment but in most cases the castings have been of a simple shape with very few sharp corners. After heat treatment, the casting is then ground to size and a

7-Foot Pipeline Is Arc Welded

TRAVERSING canyons and mountains, a 4½-mile arc welded pipeline soon will join Bouquet Canyon reservoir with the Owens Valley aqueduct, near Saugus, Calif. The line will form a part of the gigantic new water system of the city of Los Angeles.

The new Bouquet Canyon dam replaces San Francis dam, destroyed several years ago. Water will be carried from the reservoir back of the dam to a power house surge chamber where the Owens aqueduct also empties.

The pipeline under construction is said to be the largest in the West. It varies in diameter from 94 down to 80 inches, depending upon the pressure. Pipe of 80-inch diameter is used where the pressure is the greatest, in this case the wall thickness being 1 1/16 inches. At the bottom of one of the canyons crossed, the water pressure will be equal to 400 pounds per square inch. The terrain traversed is extremely rough with unusually steep grades.

Fabrication of the pipe is being handled by the Western Pipe & Steel Co., Los Angeles. Laying of the line and field welding are done by the Los Angeles department of water and power, using welding electrodes manufactured by the Lincoln Electric Co., Cleveland. For both the pipe fabrication and the field welding, the shielded arc process was adopted.

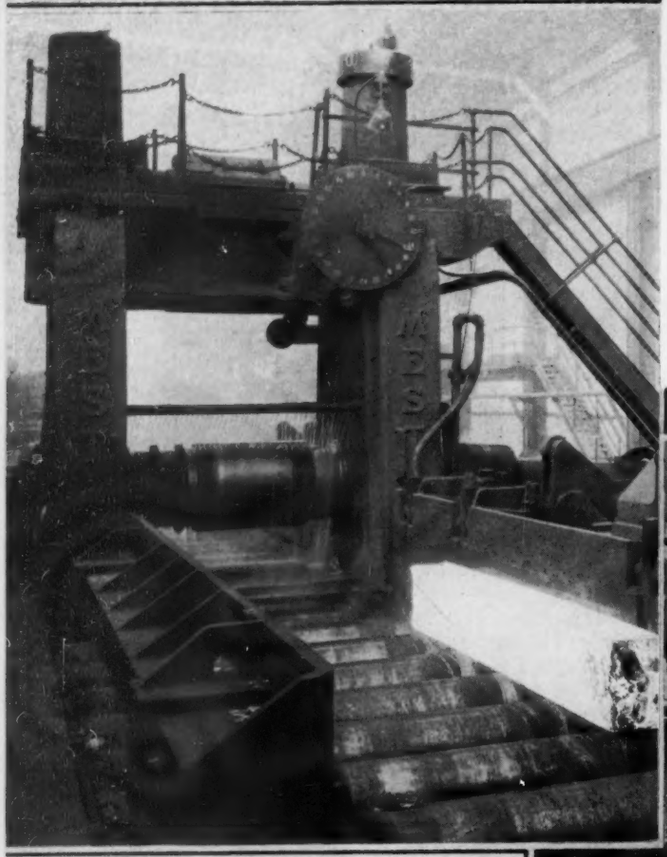
Special Placing Necessary

Sections of pipe, each weighing approximately 12 tons, are hauled to the job by trucks to a field sand-blasting and painting plant. When painted the pipe is hauled on trucks to the tops of the mountains and then lowered by a hoist down the canyon sides with carriers called "straddle bugs".

An idea of the size of this pipe is gained from the fact that it takes 450 pounds of electrode to weld each joint on the job. Thirty-two man-hours are required to weld the outside of each joint and 24 hours for the inside. The welding is being carried on 24 hours a day in three 8-hour shifts. Accompanying illustration shows an operator making an outside weld.

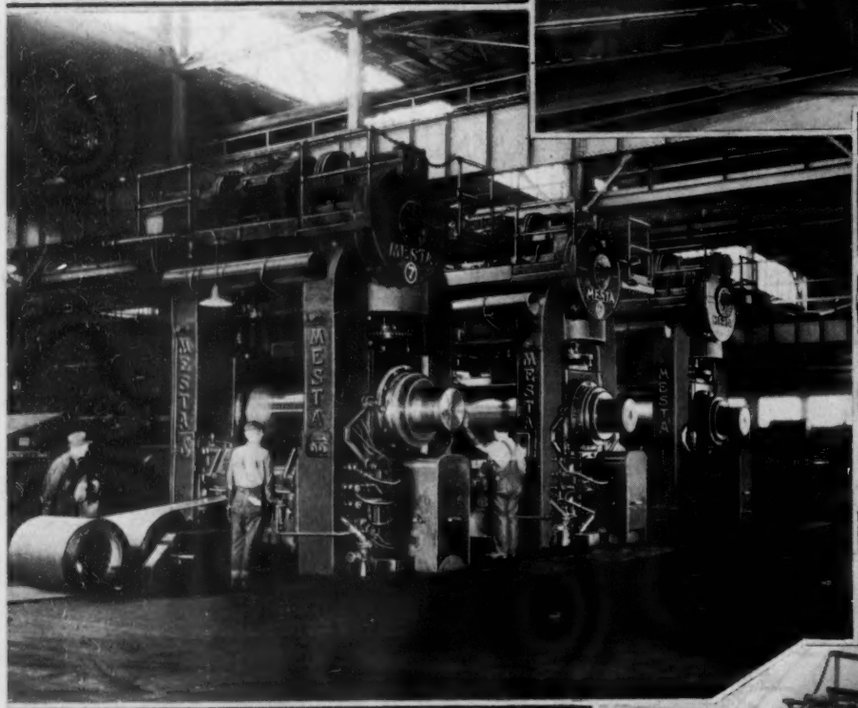
BUILT

40" BLOOMING MILL

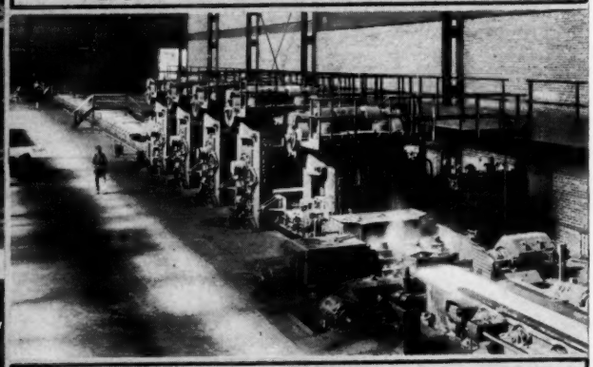


38" HOT STRIP MILL

54" COLD STRIP MILL

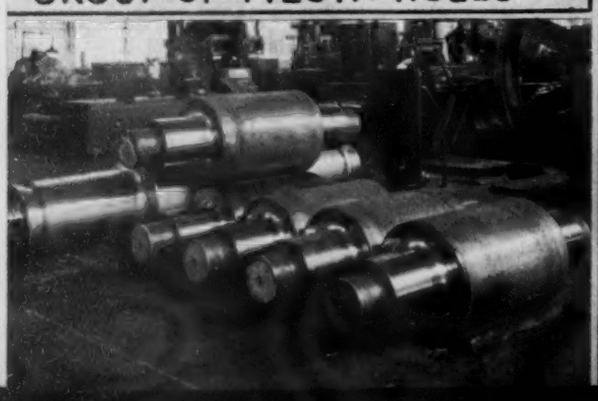


38" HOT STRIP MILL



60" HOT STRIP MILL

GROUP OF MESTA ROLLS



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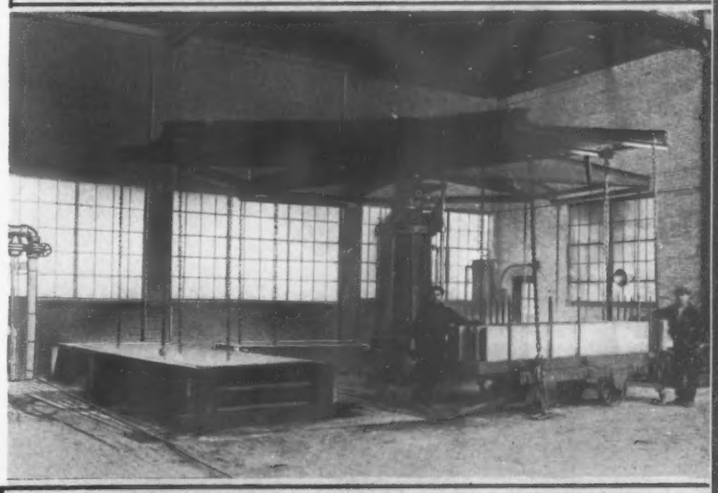
MESTA MACHINE CO.

PITTSBURGH, PA.

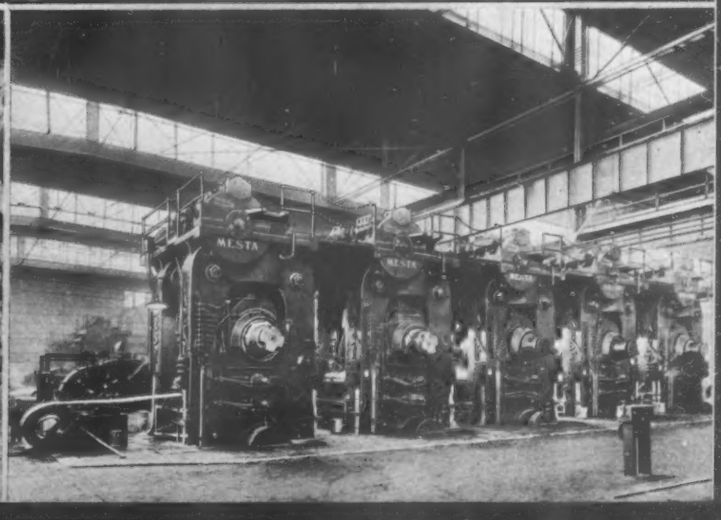
79" HOT STRIP MILL

MESTA PATENTED PICKLING MACHINE



MESTA ROTARY FLYING SHEAR

42" TANDEM TIN PLATE MILL



brinell of 475 to 525 is obtained. The grinding removes a soft skin produced during the heat treating operation. The hard matrix is broken up by the finely divided flakes of graphite which act as a lubricant in the drawing operation.

A service life 8 to 12 times greater than that obtained with untreated cast iron dies makes it possible for this material to compete with hardened tool steel dies, the much lower initial cost offsetting the somewhat longer life obtained with a hardened tool steel.

$ $ $

18-8 Oil Burner Nozzles

Stainless steel is being used for nozzles by some oil burner manufacturers. Brass was employed previously. Chromium is the dominant alloy in the steel, ranging from 12 to 24 per cent, depending upon the application, control of B.t.u.'s, the radius capacity as against the fuel intake, and so forth. Greater wear with truer orifice is claimed. At least one manufacturer is discontinuing the use of nonferrous metal entirely in favor of alloy steel. Nozzles range in weight from a few ounces to more than 100 pounds each.

$ $ $

Where more than one layer of metal is to be added in the oxyacetylene welding of 18-8 *stainless steel, the second deposit should be started an appreciable distance from the edge of the sheets being welded, otherwise a crack may develop in the weld which will follow along behind the second deposit due to the high coefficient of expansion or contraction and the weakening of the steel at red heat.*

$ $ $

Refractory Paint Developed

Developed recently is a heat-resisting aluminum paint for refractories, which, it is claimed, will withstand more than 1500 degrees Fahr. without fading. This product may be used for large brick surfaces and linings. The manufacturer also has completed research work on a refractory paint to withstand 3000 degrees Fahr. The latter is a thin, super-refractory film or lining for fire boxes, boiler furnaces, and other applications of like character.

$ $ $

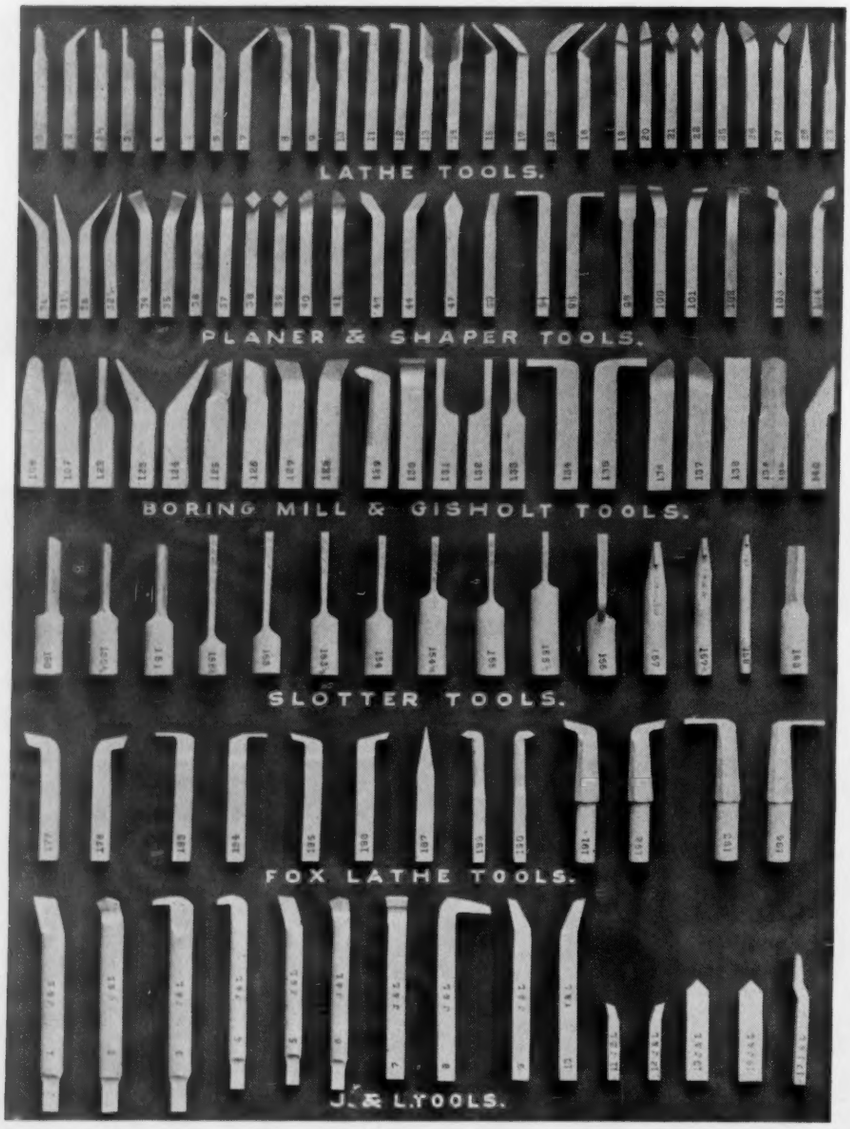
Galvanized Plates for Hulls

Something new in shipbuilding is to be tried out in the building of the seven 327-foot, 2000-ton, ocean-cruising cutters for the United States coast guard. Heavy galvanized steel plates are to be used in the hull construction of these vessels with the purpose in mind of reducing incipient corrosion. The galvanized plates will be used primarily for deck plating. Although light galvanized steel plates have been used for a number of years for superstructure bulkheads, partitions, etc., this is the first time galvanized steel is being used in hull construction. For the seven vessels, 3133 tons of galvanized plates and sheets will be required.

$ $ $

Sees Steel in Super-trains

Some metal other than aluminum, probably steel, may be used eventually in the construction of high speed diesel engine trains. According to an executive of a railroad which has just built such a train, aluminum was used to obtain lightness, weight being an important factor until more powerful engines were developed. The first completed train has a 600-horsepower diesel engine, the second six-car unti will have 900 horsepower and nine-car trains will have 1200 horsepower.



Charts Help Men To Select Tools

ONE of the problems of tool control and distribution in manufacturing plants where a wide variety of machining operations is carried on is the establishment and maintenance of standard tool shapes.

To assist in solving this problem, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., under the direction of its supervisor of small tools and applications, prepares tool charts showing the standard shape for cutting tools for each type of machine tool. A typical chart is shown in the accompanying illustration.

A chart of this kind is furnished by the tool crib attendant to machine operators for their guidance in selecting the proper tools for specific jobs.

A description of the system of tool control and distribution employed by the Westinghouse company was presented in STEEL for May 14, pp. 25-28.

Let Us Check Your. . . . . air POWER COST

. . .

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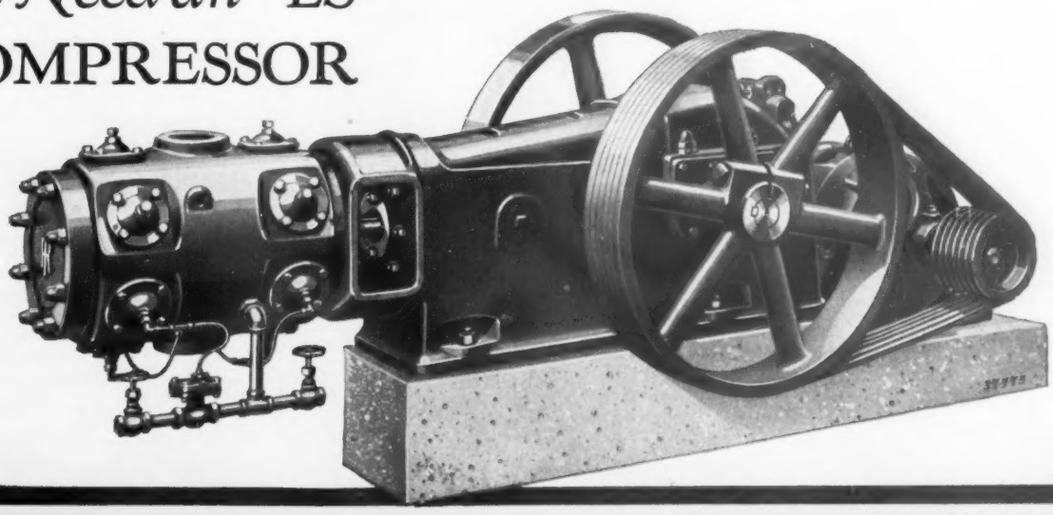
40-1

You Need an "ES"
COMPRESSOR



Ingersoll-Rand

Formerly, diesels of required power were heavy and cumbersome; units now being built are comparatively light.

$ $ $

Oil as a lubricant for certain machinery occasionally proves inadequate unless replenished frequently. One company formerly employed four men to oil and replace bushings on drills which were wearing out frequently because of insufficient lubrication from oil. With slight changes in the lubrication system, grease was used and these men were released for other work.

$ $ $

According to a recent patent, malleable cast iron may be nitrided at temperatures considerably below its thermal critical point, if from 0.15 to 5.0 per cent aluminum is added to the white iron. It is claimed that no trouble is encountered in malleablization due to the aluminum additions.

$ $ $

To be assured of an adequate supply of small repair parts, a large plant places the number of pieces considered a minimum reserve in a bag at the bottom of its stock. When all pieces except those remaining in the bag have been used, a new supply is ordered immediately.

Committee Studies Specifications

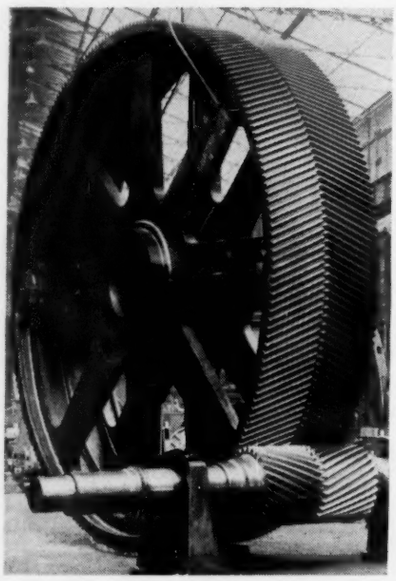
(*Concluded from Page* 34)

stricted chemical requirements and those under the heading of physical requirements have been covered by the committee in various sections of the book through the introduction of extras for "restricted requirements." There should be no attempt made to deprive a user of steel of close chemical and physical limit material, if such requirements are considered necessary, in the manufacture of a product with which he is concerned. Where such restrictions are demanded, it seems reasonable to take care of the situation by assessing a proper extra which fairly represents the increased cost involved.

If it were left to the production departments of the various mills to decide what class of product it would be their preference to make, it is, I believe, a safe assertion that they would not select products, which, generally speaking, were subject to extras. While it is presumed that extras cover the actual cost incurred producing the material, some of the factors affecting such costs are more or less indeterminate and it is questionable whether the extras, in many cases, cover completely the total costs.

That the basic idea of extras is sound may be assumed from the fact that they have been a part of the steel business for many years and with the careful study given to mill costs during recent years, extras have been established as fair and equitable. Notwithstanding the greater refinements in the manufacture of certain products made possible during the past few years, it is doubtful whether careful analytical study of mill costs will tend toward any general lowering of extras. The opposite may be quite possible because of increased wages and shorter hours in the industry.

The Technical committee has, in addition to the work outlined in this paper, been called upon to make recommendations for the correct technical descriptions and classifications of products filed with the American Iron and Steel institute, and to consider technical questions involved in complaints. The Technical committee has found after studying certain product classifications and after making recommendations concerning them, that the Commercial committee could not adopt the recommendations because of commercial aspects which were based upon trade usages of long standing. By co-operation with the Commercial committee, it has been possible to come to a better understanding of all the factors entering into the handling of the various products.



GARGANTUAN GEARWHEEL: Over 18½ *feet in diameter, these double-helical cast high-carbon steel gear-wheels, produced by the Power Plant Co. Ltd., West Drayton, Middlesex, England, are believed to be the largest of their type ever made in Great Britain. Wheels were made in halves, together have a face width of* 4 *feet* 2 *inches, comprise* 222 *teeth, weigh* 37 *tons. Pinion, weighing* 8 *tons, is about* 2½ *feet in diameter, with* 28 *double-helical teeth. Normal horsepower to be transmitted is* 2400; *peak load is* 16,000 *horsepower. Speed of the pinion is* 220 *revolutions per minute; of the wheel,* 27

Undertakes Tin Research Program

FOLLOWING out an extensive and continuous research program in the world's principal tin using countries, the International Tin Research and Development council has announced definite plans for carrying on this work in the United States.

On recommendation of D. J. Macnaughtan, director of research for the Council, Battelle Memorial Institute, Columbus, O., has been appointed to conduct research projects on tin in this country. Work is reported to be well under way, following such lines of investigation as will be of the greatest value to American manufacturers who employ tin for various purposes.

Survey Old and New Uses

As Mr. Macnaughtan pointed out in an address before the American Tin Trade association not long ago, an analysis of the major applications of tin in industry, reveals the fact that its chief use is in conjunction with copper, lead, and steel, and in the production of these metals the United States leads the world. A wide application in the use of tin also is found in this country in the form of chemical compounds affecting many industries. Technical problems, covering a number of new uses, will also be studied.

The Battelle research organization with its large technically-trained staff and modern, completely equipped laboratories will co-operate closely with the New York office of the council, the Bureau of Information in London, and the Statistical Branch at The Hague. Members of the International council include the four leading tin-producing countries—Malaya, Bolivia, Netherlands East Indies, and Nigeria.

Although tin is centuries old and a metal of far-reaching, highly-developed uses, its growing importance in this scientific age has led to a broad international research program in which much new information has already been uncovered. Due to the eminence of the United States in industrial development, the research work now in progress at Battelle Institute is regarded as one of the most important steps in the council's program.

ADVERTISING PAGES REMOVED

PRODUCING HIGH-SPEED STEEL IN THE CORELESS INDUCTION FURNACE

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AFTER the original rapid progress in the beginning of this century, the development of high-speed steels came to a certain standstill. Aside from minor improvements, no basic changes have been made in recent years and there is little likelihood for any radical innovations. The field for high-speed steels was so significant and important that prominent investigators early applied themselves to the study and improvement of these steels and greatly aided their development.

Grade Is Defined

By high-speed steels we mean a complex tool steel which differs from ordinary tool steel in that it does not lose its hardness at elevated temperatures. Its name implies a quality which is obtained by alloying elements, principally tungsten and chromium, namely, the ability to retain its hardness and therefore its cutting speed at high temperature. Early a composition of high-speed steel was found which has been retained to the present day, and the following analysis can be termed a standard composition: 0.65 to 0.90 per cent carbon, 0.10 to 0.40 per cent silicon, 0.10 to 0.30 manganese, 3.5 to 5 per cent chromium, 17 to 19 per cent tungsten and 0.5 to 1.5 per cent vanadium. In addition, often molybdenum and more recently cobalt in various amounts are added to the alloy.

Originally high-speed steels were melted in crucible furnaces exclusively. The growing use, however, necessitated a constantly increasing production and the electric arc furnace was resorted to for melting high-speed steels, and at present the greatest quantity is made in the arc furnace. By selecting the purest raw materials or careful refining procedure it was believed that a product equal to crucible steel could be melted. The Siemens-Martin furnace never attained any importance for melting high-speed steels.

The methods of manufacturing high-speed steel in the basic arc furnace was described by F. T. Sisco[1]. After melting down, the slag is made carbidic followed by the additions of ferrochrome and ferrovanadium, as well as other alloying elements. Finally, silicon is added and the carbon brought to the desired amount.

W. Oertel and A. Gruetzner[2] report the following plant procedure: After the charge becomes fluid, the slag is drawn off and replaced with a new lime slag. At the same time the deoxidizing agents are introduced, whereupon the carbonizing follows. Then a carbide slag (lime: carbon = 3:1) is made and after the slag becomes white, ferrotungsten and ferrochrome are alloyed in the mix. Ferrosilicon finally is added to the slag for reduction purposes.

The foregoing authors are agreed that it is necessary to stir the bath thoroughly to attain a uniform distribution of the alloying elements.

Recommend Pure Charges

In the manufacture of high-speed steel in the crucible, M. A. Grossmann and E. C. Bain[3] point out the significance of pure charges and the proper time to add the manganese and silicon. They prefer to introduce the manganese and silicon in the melting stage rather than after the crucible is pulled, although they state in that case the melting should be done evenly and comparatively cold. The authors, however, do not fail to appreciate the difficulties introduced by this practice.

The newest method of manufacturing high-speed steel is in the coreless induction (high - frequency) melting furnace.

The data reported in the literature regarding the quality of steels melted in the coreless induction furnace are restricted mostly to the general conclusion that such steels possess good properties and that by using pure charges the "crucible steel quality" can be obtained. Only the work of F. Wever and G. Hindrichs[4] gives a more detailed account regarding the properites of the steels. After the institute had a larger high-frequency furnace at its disposal, it was decided to conduct these experiments under practical conditions. For purely economic reasons alone it was apparent that the investigation should first be made with one of the highest grade steels, i.e. high-speed steel, in order to acquire data on this art in the high-frequency furnace.

Melting Equipment

W. Hessenbruch[5] already has described in detail the furnace equipment at our disposal. Therefore, only the conditions existing during these experiments will be mentioned briefly. The installation had a generator capacity of 100 kilowatts, producing a current of 500 cycles. The water-cooled furnace coil had an inside diameter of 19.7 inches and a height of 20.9 inches. The lining was tamped in the furnace. Although some advantages accrue from the use of preformed crucibles[6] especially in reducing the time of lining renewals, this is not so important in the present instance if the life of the tamped lining is sufficiently long and the furnace is operated intermittently so that repairs can be made. In this case, damaged sections were repaired after three or four heats, requiring about 10 minutes. Pfaelzer plastic clay was used for the acid lining which was tamped in to a thickness of 2.36 inches. It was found unnecessary to use a special buffer layer between the coil and crucible, with the acid lining. On the other hand, a layer about 1 inch found use in the case of the basic lining, because the crucible had a tendency to crack.

[1]F. T. Sisco: The Manufacture of Electric Steel (McGraw-Hill, New York.)

[2]W. Oertel and A. Gruetzner: Die Schnelldrehstahle (Verlag Stahleisen, 1931).

[3]M. A. Grossmann and E. C. Bain: High Speed Steel (John Wiley & Sons, New York).

[4]F. Wever and G. Hindrichs: Zur Kenntnis des Hochfrequenz-Induktionsofens III. Mitt. Kaiser Wilhelm Inst., Dusseldorf, Vol. 9 (1927) p. 319.

[5]W. Hessenbruch: Zur Kenntnis des Hochfrequenz-Induktionsofens IV. Mitt. Kaiser Wilhelm Inst., Dusseldorf, Vol. 13 (1931) p. 169.

[6]O. Dorrenberg and N. Broglio: Die Erzeugung von Edelstahlen im kernlosen Induktionsofen. Stahl und Eisen Vol. 50 (1930) p. 167.

This danger is especially noticeable with intermittent operation, but may be minimized considerably if care is taken to cool down slowly by filling the hot crucible with well burnt coke and using a cover. The total wall thickness of the basic crucible was about 2.56 inches. The work of W. Hessenbruch should be referred to for the composition of the basic lining material, which consisted essentially of variously grained magnesite, ground open-hearth slag and tar.

The capacity of the furnace was roughly 660 pounds. The steel was poured out of a small plug 0.7 x 1 inch, through a strainer, generally into an 8-inch mold with a heated cover. The remainder of the heats were poured either into a small 5-inch mold or in sampling molds.

The object of the experiments was to determine to what extent the coreless induction furnace was suitable for producing high-speed steels, and the most suitable schedule for making the best quality setel.

Experimental Performance

The method of conducting the melting process in the coreless induction furnace is not bound to any definite schedule. The fact that the melting is done in a crucible in which the bath readily is accessible during the melt, offers the possibility of altering the schedule in many ways to ascertain the most favorable action.

An attempt was made to utilize the following advantages of the high-frequency furnace which have an important bearing in the melting of high-speed steel:

1. The even temperature distribution throughout the bath.
2. The possibility of preventing any increase in temperature beyond that necessary, thereby limiting the absorption of gases and oxides to a minimum.
3. The possibility of greatly reducing the oxide content of the bath by repeated slag changes.
4. The good electrodynamic circulation which aids in the solution and distribution of alloy additions.

Even though the suitable use of these advantages offered by the coreless induction furnace is essential for perfect metallurgical work, the one object sought throughout these experiments was to determine in general the best metallurgical working conditions so that the results attained would offer a general authentic basis for the melting of high-speed steel.

Accordingly a series of high-speed steels were melted in acid as well as basic linings, and the individual steps from the charge to the finished product were carried out.

The results given herein are not selected individual experiments, but the whole uninterrupted series. The following ferroalloys were employed:

Ferrotungsten, with 81 per cent tungsten and 0.7 per cent carbon.
Ferrovanadium (I), with 56.8 per cent vanadium and 0.02 per cent carbon.
Ferrovanadium (II), with 82.1 per cent vanadium and 0.03 per cent carbon.
Ferrosilicon, with 45 per cent silicon.
Ferrochrome (1), with 68 per cent chromium and 1.0 per cent carbon.
Ferrochrome (II), with 63 per cent chromium and 1.0 per cent carbon.
Ferrochrome (III), with 65 per cent chromium and 0.08 per cent carbon.
Ferrochrome (IV), with 71 per cent chromium and 5.16 per cent carbon.
Ferrochrome (V), with 70 per cent chromium and 4.5 per cent carbon.

The finished heat at the required temperature was allowed to stand quiescent from 2 to 4 minutes in the furnace with the current off. The pouring time varied between 32 and 50 seconds for an 8-inch ingot. The most important data of each heat is given in Table I.

Acid Heats

The furnace was rammed with plastic clay. A glass slag was used.

Heat No. 1—This experimental heat consisted essentially in remelting high-speed scrap. In order to maintain the exact analysis, some additions had to be made after the first sample was taken. The bath was covered with a glass slag immediately after the metal was melted. This slag was removed after the alloying additions were made and replaced with a new similar slag. The first slag contained 54.7 per cent SiO_2, 7.22 per cent MnO and 7.44 per cent FeO (calculated from the total iron content).

The oxygen content[7] dropped after the slag change and the addition of 0.44 per cent Cr from 0.014 to 0.007 per cent O_2, and the total gas content, determined by hot extraction, dropped from 27.5 to 20.4 cubic centimeters per 100 grams. For finishing 0.06 per cent silicon was added. The melting temperature as well as the pouring temperature was moderate.

Heat No. 2—In this case carbon steel was melted and then alloyed. When fluid the bath was covered with a glass slag which was renewed at the end of the melt. The slag withdrawn contained 57.3 per cent SiO_2, 12.7 per cent MnO and 15.8 per cent FeO. The heat passed with a content of 0.59 per cent C, 0.26 per cent Mn and 0.035 per cent O_2. To prevent the bath from cooling too much cold alloying additions were made in this heat and to effect a thorough stirring at the same time, the full load of the generator was used and extended over a period of 30 minutes. Accordingly, the temperature rose to 1510 degrees Cent. for a short time. The slag containing 59.6 per cent SiO_2, 9.40 per cent MnO and 7.45 per cent FeO was replaced with a new glass slag. After a little regulation of the C and Cr content, the heat was finished with 0.43 per cent V and poured at a low temperature (1440 degrees Cent.).

Heat No. 3—Just as in the crucible steel process, 502 pounds carbon steel together with the necessary ferroalloys were charged and melted down under a glass slag. The first slag, analyzing 65.2 per cent SiO_2, 8.57 per cent MnO and 5.79 per cent FeO, was withdrawn and 0.4 per cent C and 48 pounds carbon steel were added to correct the composition. Then a new glass slag was introduced. By heat extraction, the following figures were obtained before and after the slag change and the finishing with 1.25 per cent V.

Before 0.007 per cent O_2; 18.7 cubic centimeters per 100 grams total gas.

After: 0.004 per cent O_2; 14.7 cubic centimeters per 100 grams total gas.

Heat No. 4—This was a repetition of the previous heat which similated the crucible steel process. The slag samples showed the following analyses: first slag, 61.0 per cent SiO_2, 7.3 per cent CaO, 0.36 per cent MgO, 4.8 per cent MnO, 15.7 per cent FeO; final slag, 70.5 per cent SiO_2, 6.2 per cent CaO, 0.36 per cent MgO, 2.4 per cent MnO, 4.7 per cent FeO.

Before and after the vanadium (1.15 per cent) addition, the following values were obtained by hot extraction:

Before: 0.011 per cent O_2; 23.8 cubic centimeters per 100 grams total gas.

After: 0.008 per cent O_2; 23.1 cubic centimeters per 100 grams total gas.

Heat No. 5—This heat followed the duplexing process, in that about 550 pounds fluid alloy carbon steel from a 5-ton basic arc furnace and poured into the high-frequency furnace heated to about 650 degrees Cent., and thoroughly covered with a glass slag. The charge had the following analyses: 0.74 per cent C, 0.18 per cent Si, 0.37 per cent Mn, 0.006 per cent P, 0.012 per cent S, 0.53 per cent Cr and 0.26 per cent Ni.

The initial low temperatures were raised to 1530 degrees Cent. in about 30 minutes. Then the alloying was completed within 30 minutes with full generator load and at a constant temperature. The alloying materials in this case, as well as all following heats, were preheated to a red heat. The analysis later was regulated by adding 66 pounds carbon steel and some ferrochrome. Finally, 1.1 per cent V was added.

Slag changes were made before the alloying, before the realloying and before the vanadium addition. These slags had the following compositions

Slag No.	SiO_2, %	CaO, %	MgO, %	NnO, %	FeO, %
1	67.6	12.2	0.14	3.68	3.86
2	64.5	11.03	0.14	6.02	4.40
3	62.5	.....	.....	7.56	4.12

During the heat, the following values were obtained by the hot extraction process:

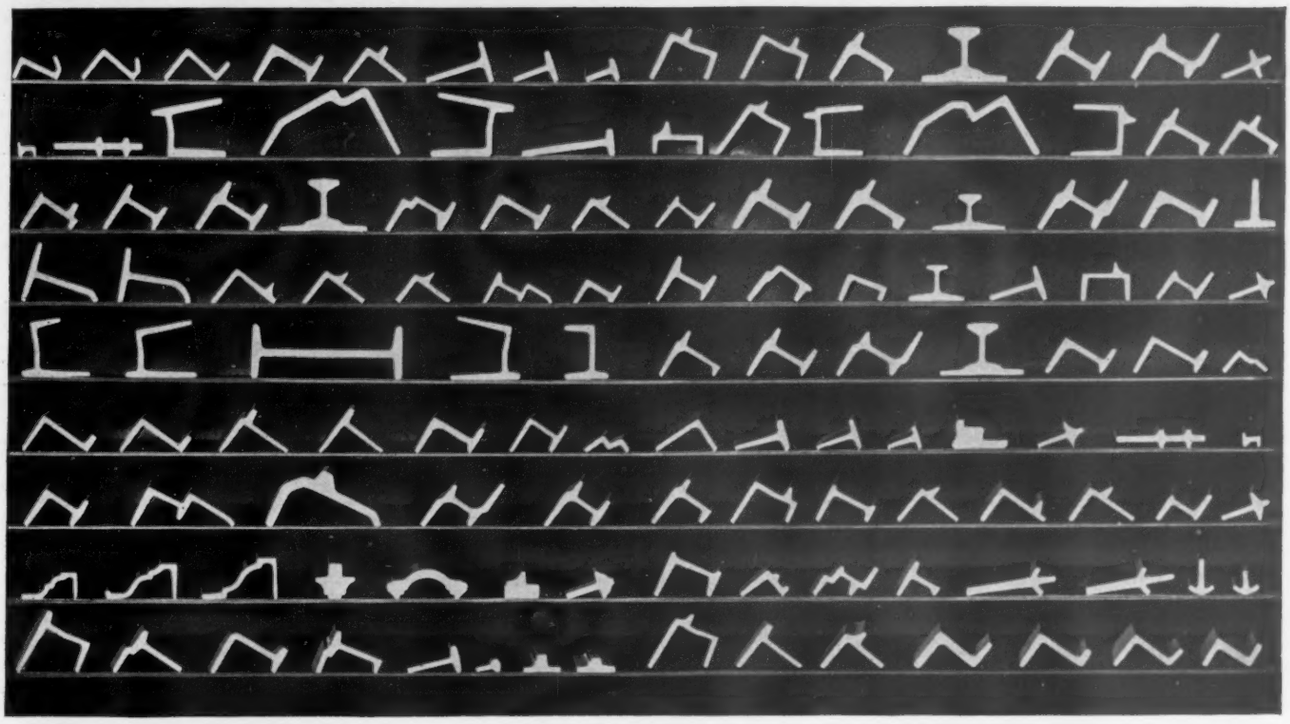
	O_2, %	Total gas, cubic centimeters per 100 grams
After melting	0.006	15.6
After alloying	0.008	21.9
After realloying	0.008	20.1

Heat No. 6—Just as in Heat No. 5, about 396 pounds steel was taken from a basic arc furnace, having the following analysis: 1.19 per cent C, 0.14 per cent Si, 0.31 per cent Mn, 0.01 per cent P, 0.012 per cent S, 0.08 per cent Ni and 1.33 per cent W, and placed in the acid high-frequency furnace under a glass slag. The alloying required about 30 minutes. Slag changes and gas samples were taken at the same periods as in Heat No. 5. The following are the slag values:

Slag No.	SiO_2, %	CaO, %	MgO, %	MnO, %	FeO, %
1	50.1	4.9	trace	8.2	17.7
2	58.3	7.5	0.34	9.5	9.46
3	61.2	11.5	1.3	3.7	3.22

[7]The samples for determining oxygen consisted of rods 10 in. diameter, obtained by quenching the steel in copper molds.

CONSIDER THE POSSIBILITIES



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BETHLEHEM ROLLED SECTIONS

The poured gas samples showed:

	O_2, %	Total gas, cubic centimeters per 100 grams
Start of melting.....	0.008	19.7
Just prior to pouring	0.004	12.3

Heat No. 7—This heat was characterized by the pure charge.

Due to the large volume of the charge, only a heel of metal could at first be melted—315 pounds. (A portion of the charge consisted of only lightly compressed sponge iron.) The charge became fluid in 45 minutes. About 64 pounds of material was added and another 161 pounds within 1 hour, 17 minutes. The slag was renewed after the first heel was melted as well as after melting the whole charge. The slag showed the following analyses:

Slag No.	SiO_2, %	MnO, %	FeO, %
1	50.8	4.29	30.65
2	66.1	5.50	9.65

The greater part of the alloying elements were introduced within 30 minutes; a small portion subsequently added, finished with 0.73 per cent V. By hot extraction it was found:

	O_2, %	Total gas, cubic centimeters per 100 grams
Prior to realloying and finishing	0.011	19.6
After realloying and finishing	0.005	12.9

Heat No. 8—(8a) This heat was different from heats Nos. 5 and 6 in that the finished alloy high-speed steel (heat No. 8) melted in the basic furnace was poured into the high-frequency furnace, to determine what effect an after treatment in the acid lining would have on the quality. The oxygen and other gaseous contents were constant throughout the whole melting course; in four samples the oxygen content shows 0.006 per cent.

Basic Heats

As previously mentioned, the furnace lining consisted of magnesite. A mixture of lime and fluorspar served as a slag, aside from the reduction slag.

Heat No. 9—The charge consisted of high-speed steel scrap (forging heads). The first slag (36.96 per cent SiO_2, 0.09 per cent Fe_2O_3, 4.83 per cent FeO, 3.34 per cent MnO, 29.9 per cent CaO, 8.01 per cent MgO) was removed and a new lime-fluorspar slag introduced. A steel sample showed 0.005 per cent O_2 cubic centimeters per 100 grams total gas. The charge weight was increased with high-speed steel scrap (also forging heads). After becoming fluid, 5.72 pounds ferrotungsten was added and 6.6 pounds reducing slag introduced. After about 30 minutes the slag was removed (28.08 per cent SiO_2, 0.61 per cent Fe_2O_3, 1.09 per cent FeO, 0.46 per cent MnO, 42.7 per cent CaO, 8.23 per cent MgO), and a new reducing slag added. A second sample showed 0.004 per cent O_2, 23.6 cubic centimeters per 100 grams total gas.

The heat was finished with 0.07 per cent Si and 0.31 per cent V. The final heat contained 0.003 per cent O_2, 16.46 cubic centimeters per 100 grams total gas.

Heat No. 10—The charge consisted of unalloyed steel, which was alloyed after melting. Slag changes were made after melting and after alloying. A reducing slag was introduced with the first change which was renewed in 45 minutes.

Slag No.	SiO_2, %	Fe_2O_3, %	FeO, %	MnO, %	CaO, %	MgO, %
1	34.88	0.42	5.34	4.04	28.7	10.02
2	27.05	0.14	2.07	0.66	43.24	7.52
3	27.06	0.23	2.53	2.01	32.9	16.5

After the first slag change, the steel contained 0.022 per cent O_2, 42.7 cubic centimeters per 100 grams total gas. The heat was finished with 0.065 per cent Si and 0.48 per cent V, whereupon the oxygen content dropped to 0.001 per cent and the total gas to 7.4 cubic centimeters per 100 grams.

Heat No. 11.—A charge of unalloyed steel and the necessary ferroalloys were melted down, as in the crucible process. A portion (154 pounds) of the steel had to be added afterwards. A lime-fluorspar was introduced after the melting, and 30 minutes later a reducing slag was introduced which was renewed in one hour. The second slag had the following analysis: 30.4

Table I

Record of Heats

Furnace lining	Heat No.	Charge and Alloys	Average Melting Temp. ° Cent.	Pouring temp. °Cent.	Melting Time To reach fluid State hr.	min.	Total kwh/ton hr.	min.	Power Consumption To reach Fluid state	Total kwh/ton	Weight of charge pounds
Acid	1	Charge: 595 lbs. high-speed scrap, 60 lbs. unalloyed steel; 0.44-lb. C and 4.4 lbs. FeCr (III) Added after. Finished with 8.8. lbs. FeSi (.06% Si)	1470	1450 to 1460	1	45	4	18	747	1066	650
Acid	2	Charge: 507 lbs. unalloyed steel. After melting down, alloyed with 143 lbs. FeW, 31 lbs. FeCr (I). Further alloyed with 11 lbs. FeCr. (I) and 1.2 lbs. C. Finished with 5.3 lbs. FeV (I) (.43% V)	1460	1440	1	55	5	30	869	1388	697
Acid	3	Charge: 503 lbs. unalloyed steel. 176 lbs. FeW and 53 lbs. FeCr. (II). Some C and 49 lbs. unalloyed Steel added. Finished with 17 lbs. FeV (I) (1.25% V)	1470	1450	2	10	5	15	783	979	780
Acid	4	Charge: 496 lbs. low alloy steel. 143 lbs. FeW, 55 lbs. FeCr. (II). Alloyed after with 10 lbs. FeV (II) (1.15% V)	1480	1460	2	15	5	20	795	1240	708
Acid	5	Charge: Fluid low alloy steel from basic arc furnace. Added 154 lbs. FeW, 37 lbs. FeCr (II), 66 lbs. unalloyed steel with 3 lbs. FeCr (III). Finished with 16 lbs. FeV (I). (1.1% V)	1460 to 1470	1450	..	..	3	26	....	416	816
Acid	6	Charge: Fluid low alloy steel from basic arc furnace. Alloyed with 137 lbs. FeW, 35 lbs. FeCr (III). Finished with 0.48-lb. FeMn (74%) and 7 lbs. FeV (II) (.95% V)	1460 to 1470	1450 to 1460	..	..	4	10	....	865	573
Acid	7	Charge: 265 lbs. Sponge iron, 165 lbs. Swedish raw bars and 110 lbs. Swedish raw iron. After melting, alloyed with 154 lbs. FeW, 38 lbs. FeCr (IV). Realloyed with 18 lbs. FeW and 9 lbs. FeCr- (III). Fin. with 10 lbs. FeV (.73% V)	1470 to 1480	1460	2	30	6	05	980	1313	767
Acid	8a	Charge: Fluid finished alloy high speed steel from basic arc furnace.	1480 to 1490	1460	..	..	1	00	....	250	507
Basic	9	Charge: 578 lbs. High-speed scrap; 88 lbs. added. Alloyed with 6 lbs. FeW. Finished with 1 lb. FeSi (0.7% Si) and 4 lbs. FeV (I) (.31% V)	1480	1460	2	00	3	45	846	1333	677
Basic	10	Charge: 463 lbs. Unalloyed steel. After melting, alloyed with 172 lbs. FeW, 31 lbs. FeCr (V) and 11 lbs. FeCr (III). Finished with 10 lbs. FeSi (.07% Si) and 6 lbs. FeV (I) (.48% V)	1480	1450	1	45	4	50	900	1339	683
Basic	11	Charge: 353 lbs. Unalloyed steel, 154 lbs. FeW, 40 lbs. FeCr (V). 154 lbs. unalloyed steel added. Finished with 0.4-lb. FeSi (.03% Si) and 11 lbs. FeV (I) (.87% V)	1480	1460	2	49	4	57	969	1349	712
Basic	12	Charge: 220 lbs. Iron Sponge, 165 lbs. Swedish raw bars and 115 lbs. Swedish raw iron. After melting, alloyed with 110 lbs. FeW and 33 lbs. FeCr. (V). Realloyed with 30 lbs. FeW and 4 lbs. FeCr (III). Finished with 0.55 lbs. FeSi (.04% Si.) and 13 lbs. FeV (I) (1.08% V).	1480	1450 to 1460	1	39	4	50	830	1550	690

Table II

Chemical Analyses of Steels Melted

Heat No.	C %	Si %	Mn %	P %	S %	Cr %	W %	V %	Mo %	Ni %
1	0.79	0.21	0.25	0.008	0.015	4.11	18.68	0.91	0.47	0.25
2	0.77	0.14	0.20	0.008	0.018	4.09	17.37	0.46	trace	....
3	0.81	0.19	0.22	0.007	0.016	4.50	16.85	1.17	trace	....
4	0.79	0.21	0.24	0.006	0.018	5.25	17.55	1.65	trace	0.16
5	0.79	0.21	0.35	0.006	0.009	4.13	17.35	1.28	trace	....
6	0.83	0.09	0.15	0.007	0.011	3.84	19.59	0.83	trace	0.10
7	0.82	0.12	0.24	0.011	0.021	3.94	17.94	0.73	trace	trace
8	0.79	0.31	0.32	0.022	0.009	3.56	17.94	0.54	trace	0.27
8a	0.79	0.31	0.38	0.023	0.010	3.56	18.15	0.54	trace	0.28
9	0.79	0.28	0.49	0.014	0.007	4.43	18.39	0.89	0.25	0.34
10	0.84	0.09	0.32	0.013	0.011	4.25	17.98	0.55	trace	0.27
11	0.81	0.12	0.42	0.010	0.012	4.03	17.55	0.98	trace	0.17
12	0.86	0.07	0.16	0.007	0.017	3.63	17.37	1.00	trace	trace

per cent SiO_2, 18 per cent Fe_2O_3, 3.1 per cent FeO, 1.1 per cent MnO, 42.8 per cent CaO and 8.4 per cent MgO. The oxygen content fell from 0.007 to 0.004 per cent after introducing the reducing slag, and the total gas from 18.8 to 13.3 cubic centimeters per 100 grams. Finishing was done with 0.028 per cent Si and 0.87 per cent V. The oxygen content remained unaltered.

Heat No. 12—In this heat a pure charge again was used of the same composition as in heat No. 7. The "heel" was melted down from 79 pounds sponge iron, 165 pounds muck bars and 115 pounds pig iron. Later 141 pounds of sponge was added. Thirty minutes after melting the bath contained 0.006 per cent O_2 and 28.1 cubic centimeters per 100 grams total gas. After adding the tungsten, the oxygen content remained constant at 0.006 per cent but fell to 0.004 per cent after the ferrochrome addition, with the total gas at 21.4 cubic centimeters per 100 grams. The first slag with 31.2 per cent SiO_2, 0.95 per cent Fe_2O_3, 4.94 per cent FeO, 3.42 per cent MnO, 34.7 per cent CaO and 9.1 per cent MgO, was replaced with a reducing slag. After realloying, the bath remained at a moderate temperature for 90 minutes. The oxygen then showed 0.005 per cent and the total gas 20.3 cubic centimeters per 100 grams. The heat then was finished with 0.036 per cent Si and 1.08 per cent V. The slag composition at the end of charging was: 26.6 per cent SiO_2, 0.10 per cent Fe_2O_3, 1.72 per cent FeO, 0.21 per cent MnO, 58.7 per cent CaO and 5.6 per cent MgO.

Table II shows the analysis of the individual heats.

Chemical Details Cited

The carbon content varies between 0.77 and 0.86 per cent. Silicon and manganese are low, which is customary and preferable for high-speed steels. Chromium and vanadium was varied considerably, while tungsten was held fairly constant except for heats Nos. 3 and 6. Molybdenum is present only in traces; measurable contents occurring only in heats in which high-speed scrap was used. The nickel content is attributed to the fact that practically all steel scrap contains nickel nowadays. Phosphorus and sulphur content is low. The loss of useful alloying elements, such as tungsten, vanadium and chromium, was under 1 per cent in every case.

Although the values vary somewhat from each other in certain cases, which partially is due to the uncertainty of the processes, these differences are not noticeable in the later capacity tests. It also should be noted that where fluid charges were used no suitable scale was available so that the weights had to be calculated from the bath height, which also introduced some error.

(To be continued)

Announces High Tensile Strength Electrode

Welds with tensile strengths of 85,000 to 100,000 pounds per square inch are said to be possible with a new arc welding electrode announced by the Lincoln Electric Co., Cleveland. This electrode, designated as Shield Arc 85, is designed especially for use on high tensile steels; here it provides welds of the strengths mentioned and unusually high ductility. The ductility ranges from 15 to 20 per cent elongation in 2 inches.

The product of several years of research, this electrode is of heavily coated, shielded arc type. It is claimed to be particularly suitable for the welding of those low alloy structural steels which on normalizing have tensile strengths under 100,000 pounds per square inch; for example, cromansil, low-carbon nickel steels, structural silicon steels, low carbon manganese steels vanadium steels, and in general, all low alloy steels under O0.30 per cent carbon.

It is obvious that the chemical composition of the plate being welded will affect the tensile strength and ductility of the weld. When deposited in mild steel plate, the weld metal will have a tensile strength of approximately 78,000 to 85,000 pounds per square inch, yield point 60,000 to 70,000 pounds per square inch, and 15 to 20 per cent elongation in 2 inches in the as-welded condition. Welds in high tensile plate will have a higher strength.

According to the manufacturer, the new electrode is suitable for flat, vertical and overhead welding, and is available in 5/32 and 3/16-inch sizes. For most vertical and overhead welding, the 5/32-inch size is preferred; however, for vertical welds in thick plate 3/16-inch may be used.

Boulder Dam Transformers Will Use High Voltage

Eleven power transformers for Boulder dam, seven of which are rated 55,000 kilovolt-amperes at 287,000 volts, said to be the highest commercial voltage of any transformer built in the United States, will be manufactured at the Pittsfield, Mass., works of the General Electric Co., under terms of a federal contract.

Shipment of the transformers, valued at about $1,000,000, is scheduled in about a year.

The larger transformers are water cooled, will weigh over 400,000 pounds each, and are approximately 32 feet high, 20 feet wide and 13 feet deep. The four smaller ones are rated 13,333 kilovolt-amperes at 138,000 volts and are forced-oil cooled.

Also for use at Boulder dam, the Schenectady works of the company now is building two 82,500 kilovolt-ampere generators which will be connected to 115,000-horespower waterwheels, and the Philadelphia works is building eight superspeed impulse oil circuit breakers for the city of Los Angeles transmission lines which will break an electric circuit in 0.05-second.

Film Shows Oxyacetylene Welding and Cutting

A new 2-reel motion picture, "The Prosperity Process," has just been produced by the International Acetylene association, 30 East Forty-second street, New York. This picture shows the application of the oxyacetylene process of welding and cutting metals to a wide range of industrial problems in the repair, reclamation and production of metal parts.

The picture is suitable for technical society meetings; engineering colleges; technical, high and trade schools; student sections of engineering societies; superintendents' meetings; safety meetings; foremen's club meetings; and other similar gatherings. Approximately 25 minutes is required for its showing.

The film is available in 16-millimeter size, which can be shown on standard portable motion picture projectors. Arrangements to borrow the film can be made through the office of the association secretary.

It's the Norton "B" Bond (White Wheel)

WITH tool room men everywhere the Norton "B" bond "white wheel" is becoming increasingly popular. They like its fast, free cutting action with no tendency to burn . . . even on the hardest die steels and alloys. They like the way it holds its shape and size . . . the few dressings that are necessary.

There are three mighty good reasons for the success of the Norton "white wheel." In it are combined three important Norton features:

1. 38 Alundum abrasive—hard, sharp and free cutting.
2. "B" bond—a much improved type of vitrified bond.
3. Controlled Structure—positive regulation of grain spacing to give the best grinding action for each job.

If you are not already using the Norton "white wheel" in your tool room it will pay you to try it.

NORTON COMPANY
Worcester, Mass.

W-480

HAVE YOU ANY WORN OR SLIPPERY STAIRWAYS?

Repairs are easy with the Alundum Rubber Bonded Safety Tread. It is permanently non-slip and extremely wear-resisting. Write for information.

PROGRESS IN STEELMAKING

RECLAMATION of ten chrome-molybdenum alloy rolls for the manufacture of barrel hoops recently was accomplished at a saving exceeding $10,000 by the use of special alloy welding rod and gas welding.

♦ ♦ ♦

Resistant to abrasion, slag penetration and spalling are some of the qualifications of a new chrome-base castable refractory for building monolithic bottoms in billet, bar, plate, strip, forging and other steel mill heating furnaces. The product, which is supplied in granular form and mixed with water to a stiff, plastic constituency, is scattered on the furnace hearth, leveled and troweled smooth. On account of its quick-setting property at room temperature the material can be put under heat in 4 to 24 hours. No burning-in is required.

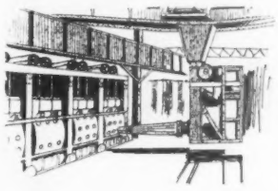
♦ ♦ ♦

Reforming the tap hole of an open-hearth furnace is accomplished by installing a standard steel pipe at the proper slope and packing a recently developed chrome-base castable refractory between it and the brickwork.

The pipe burns out when the heat of steel is tapped.

♦ ♦ ♦

Standard pipe and fittings are used in a newly devised light for warning workmen at blast furnaces and steel plants that overhead construction work is underway. The unit is equipped with a 5-way lantern with ruby lenses in the four sides and a clear lense in the bottom, the latter illuminating a sign which reads—"Stop, you may be injured by men working overhead." The lantern is equipped with a 60-watt lamp and a "winker" button.



LINING plate and merchant mill furnace doors with a refractory material prepared with a special type binder has effected at one plant a reduction in cost from $2.34 per month per door to 35 cents per month per door.

♦ ♦ ♦

Bonding mortar possessing properties which make it suitable for use in all basic furnaces is of recent development. Grain magnesite containing a low percentage of impurities is the base of the new material. Suitable bonding is assured by a balanced series of constituents; one which gives a cold set, another which functions at a higher temperature where the cold setting agent becomes less effective, and still another which imparts strength to the mortar through the temperature interval just below the temperature at which a ceramic set occurs. The design of the bonding material, therefore, affords laying up magnesite brick with a mortar of the same chemical composition and assures firm cementation at all temperatures. The plasticity of the refractory permits the forming of either dipped or troweled joints.

♦ ♦ ♦

Removing defects from the surface of billets and slabs by gouging with oxyacetylene is being effected by a large steelmaker at a saving of $1.75 a ton compared with the method previously used.

♦ ♦ ♦

Hard facing the carbon scrapers used at by-product coke ovens in the Detroit district has lengthened their term of service to 16 weeks; their campaign formerly was one week. An additional saving was effected by use of machine steel instead of high-speed steel as the base metal of the hard-faced parts.

♦ ♦ ♦

Electrical heating of expansion tubes used to separate the flanges in blast furnace and steelworks gas mains to permit goggle valves to be opened or closed, has been developed. A goggle valve consists of a thin rolled plate in the shape of a figure 8, one-half being closed and other open, and can be swung between the flanges of the gas main to shut off or permit the flow of gas. Prevailing thermal expansion units employ steam to heat the expansion tube to about 300 degrees Fahr., which in turn effect a contraction of the flange to permit movement of the diaphram or goggle. Temperatures of 900 degrees Fahr. are afforded by electric heater units. Energy required for quick heat varies from 15 to 50 kilowatts depending on the diameter of the gas main and whether the installation uses one or more tubes.

Testing Materials Society Completes Program for Atlantic City Meeting

AMERICAN SOCIETY FOR TESTING MATERIALS has announced the provisional program for its thirty-seventh annual meeting to be held at Chalfonte-Haddon Hall, Atlantic City, N. J., June 25-29. Of the 15 sessions scheduled, nine have direct interest to engineers and technicians of the iron, steel and metalworking industries.

Among subjects to be discussed at these sessions are nomenclature and testing, steel, wrought iron, cast iron, coal and coke, specifying and controlling quality, effect of temperature on metals, fatigue of metals, corrosion, nonferrous metals and metallography. A variation from custom is elimination of the A.S.T.M. dinner.

The presidential address will be presented at a general session on Wednesday evening. Upon this occasion the Charles B. Dudley medal will be awarded to R. L. Templin, chief engineer of tests, Aluminum Co. of America, New Kensington, Pa., for the outstanding paper presented at the 1933 annual meeting. Mr. Templin's paper was "Fatigue Properties of Light Metals and Alloys."

Following is the schedule of sessions listing reports of standing committees and technical papers to be presented:

Tuesday, June 26

AFTERNOON

Nomenclature and Testing

Report of committee E-9 on research.
Report of committee E-10 on standards.
Report of committee E-8 on nomenclature and definitions.
Report of committee E-1 on methods of testing.
"Effect of Thickness on the Accuracy of Rockwell Hardness Tests on Thin Sheets," by R. L. Kenyon, American Rolling Mill Co.
"Characteristics of the Huggenberger Tensometer," by R. W. Vose, Massachusetts Institute of Technology.
"Concerning the Effects of Notches and Laws of Similitude in Material Testing," by A. Nadai and C. W. MacGregor, Westinghouse Electric & Mfg. Co.

Wednesday, June 27

MORNING

Steel, Wrought Iron, Cast Iron

Report of committee A-6 on magnetic properties.
Report of committee A-9 on ferroalloys.
Report of committee A-1 on steel.
"Effect of Size and Shape of Test Specimen Upon the Observed Physical Properties of Structural Steel," by Inge Lyse and C. C. Keyser, Lehigh university.
"Testing Sheets for Blue Brittleness and Stability Against Changes Due to Aging," by R. L. Kenyon and R. S. Burns, American Rolling Mill Co.
Report of joint committee on investagation of the effect of phosphorus and sulphur in steel.
Report of sectional committee on standardization of dimensions and material of wrought iron and wrought steel pipe and tubing.
Report of committee A-2 on wrought iron.
Report of committee A-3 on cast iron.
Report of sectional committee on specifications for cast iron pipe and special fittings.

Coal and Coke

Report of committee D-5 on coal and coke.
Report of sectional committee on classification of coals.

AFTERNOON

Specifying and Controlling Quality

"Acceptance-Rejection Requirements in Specifications," by H. F. Dodge, Bell Telephone Laboratories Inc.
"Application of Statistical Methods to the Solution of Metallurgical Problems in the Steel Plant," by W. C. Chancellor, National Tube Co.

Marburg Lecture

"Water as an Engineering and Industrial Material," by Dr. Sheppard T. Powell, consulting sanitary and chemical engineer, Baltimore.

EVENING

Annual Meeting

Presidential address by T. R. Lawson.
Award of Dudley medal.

Thursday, June 28

MORNING

Effect of Temperature on Metals, Fatigue of Metals

Report of joint research committee of A. S. M. E. and A. S. T. M. on effect of temperature on the properties of metals.
"Interpretation of Creep Tests," by P. G. McVetty, Westinghouse Electric & Mfg. Co.
"Creep Properties of 5 Per Cent Chromium and 0.5 Per Cent Molybdenum Steel Still Tubes," by H. C. Cross, Battelle Memorial institute, and E. R. Johnson, Republic Steel Corp.
"Aging Embrittlement of 4 to 6 Per Cent Chromium Steel," by H. M. Wilten and E. S. Dixon, Texas Co.
Report of research committee on fatigue of metals.
"A High-Speed Fatigue Testing Machine and Some Tests of Speed Effect on Endurance Limit," by G. N. Krouse, University of Illinois.

EVENING

Corrosion

Report of committee A-10 on iron-chromium, iron-chromium-nickel and related alloys.
Report of committee A-5 on corrosion of iron and steel.
"Use of Bureau of Standards Soil Corrosion Data in the Design and Protection of Pipe Lines," by K. H. Logan, national bureau of standards.
"Observations on Effect of Surface Finish on the Initial Corrosion of Steel Under Water," by L. J. Waldron and E. C. Groesbeck, national bureau of standards.
Report of committee B-3 on corrosion of nonferrous metals and alloys.
"Determination of Traces of Dissolved Oxygen by the Winkler Method," by M. C. Schwartz and W. B. Gurney, Louisiana Steam Generating Co.
Report of committee D-19 on water for industrial uses.

Friday, June 29

MORNING

Nonferrous Metals, Metallography

Report of committee B-2 on nonferrous metals and alloys.
"Some Factors Affecting Strain Measurements in Tests of Metals," by R. L. Templin, Aluminum Co. of America.
Report of committee B-6 on die-cast metals and alloys.
"Impact Strength of Commercial Zinc Die Castings," by E. A. Anderson and G. L. Werley, New Jersey Zinc Co.
Report of committee B-7 on light metals and alloys, cast and wrought.
Report of committee E-4 on metallography.
"Notes on Frictional Resistance of Steel and Brass in Shrink Fits," by W. H. Swanger, national bureau of standards.

A. S. T. M. Nominations For National Officers

W. H. Bassett, metallurgical manager, American Brass Co., Waterbury, Conn., recently was nominated for president of the American Society for Testing Materials. During the past year, Mr. Bassett has held the office of vice president and he has long been active in affairs of the organization.

For vice president, H. S. Vassar, laboratory engineer, Public Service Electric & Gas Co., Irvington, N. J., was nominated.

Members of the executive committee were nominated as follows: H. A. Anderson, metallurgical engineer, Western Electric Co., Chicago; H. J. Ball, professor of textile engineering, Lowell Textile institute, Lowell, Mass.; W. M. Barr, assistant to executive vice president, Union Pacific railroad, Omaha, Nebr.; L. S. Marsh, manager, department of inspection and metallurgy, Inland Steel Co., Chicago; and J. B. Rather, in charge of general laboratories, Socony-Vacuum Corp., New York.

Although the membership elects its officers by mail ballot, nomination virtually assures election. The new officers will assume their posts at the close of the annual meeting in Atlantic City, June 25-29.

Develops Timing Control For Use in Spot Welding

A new, low-cost timing control for spot welders has been placed on the market by General Electric Co., Schenectady, N. Y. The timing element in this unit includes a small synchronous motor having a range of adjustment from 5 to 50 cycles of the power supply with an accuracy of approximately ½-cycle. It may be applied to all spot welding applications with the exception of those requiring very short timing—less than 5 cycles, for instance, as is the case with thin sheets of aluminum and stainless steel.

A Worthy Addition to Pittsburgh's Notable BRIDGES

PITTSBURGH, "the city of bridges," with 500 crossings, large and small, in the area of Allegheny County, has a worthy example of one added type since the Tenth Street Bridge over the Monongahela River was finished in 1933.

This parallel-wire-cable suspension structure has a main span of 725 feet, with side spans of 275 feet each. The steel towers that carry the cables are about 115 feet high. The bridge floor, with its stiffening system, hung from the 12⅝-inch cables by 1¾-inch wire ropes, provides a 40 foot roadway with two seven-foot sidewalks; and being of Carnegie Steel Company's T-Tri-Lok construction, it has very great strength with relatively little weight.

Designed by the engineering division of the Department of Public Works of Allegheny County, this bridge, like many of its Pittsburgh predecessors, was fabricated and erected by American Bridge Company.

On any steel construction of whatever type or size—bridge, building, barge, tower, viaduct,—American Bridge Company facilities and experience are always at your service.

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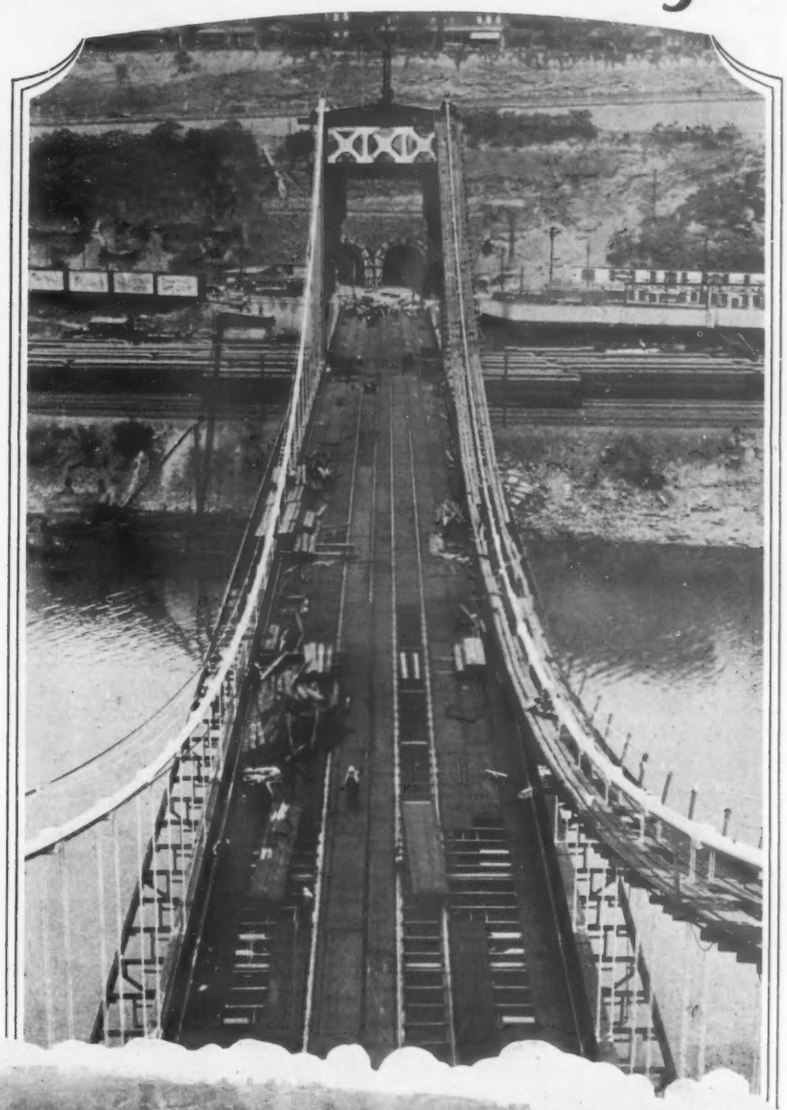


Laying T-Tri-Lok flooring on Tenth Street Bridge. At far end, entrance to Armstrong Tunnel.

AMERICAN BRIDGE COMPANY

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

General Office: Frick Building, Pittsburgh, Pennsylvania

Contracting Offices: Baltimore, Boston, Chicago, Cincinnati, Cleveland, Denver, Detroit, Duluth, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, Salt Lake City.

Pacific Coast Distributors: Columbia Steel Company, Russ Building, San Francisco *Export Distributors:* United States Steel Products Company, New York

Develops Thawing Equipment For Open-Top Coal Cars

DURING freezing weather, great difficulty is experienced at car dumping docks in dumping coal from open-top railroad cars into boats, because the coal freezes to the shell plates of the cars.

It has been the custom to use steam jets directed against the sides and bottoms of the cars, or to build fires between the tracks on both sides of the cars to thaw the ice. Both of these methods are inefficient and costly and have the decided disadvantage of failure to overcome the difficulty in a satisfactory manner, as the net result is too few cars per hour.

To eliminate these difficulties and to provide an efficient and economical method of preparing the frozen cars for dumper operation, the Wellman Engineering Co., Cleveland, has developed car thawing equipment. This equipment, shown in the accompanying illustration, consists of duplicate units, disposed on opposite sides of the approach tracks leading to the car dumper mounted on tracks laid at right angles to the car tracks. The units are capable of movement toward the car side in order to secure heat concentration on the car and away from the heated car to provide clearance for the passage of the car along the track.

Sliding gates, operated in conjunction with the heating units are provided at each end. The movement of the heating units also actuates the gates. As the units move toward the sides of the car, the end gates close and the car is thus completely surrounded.

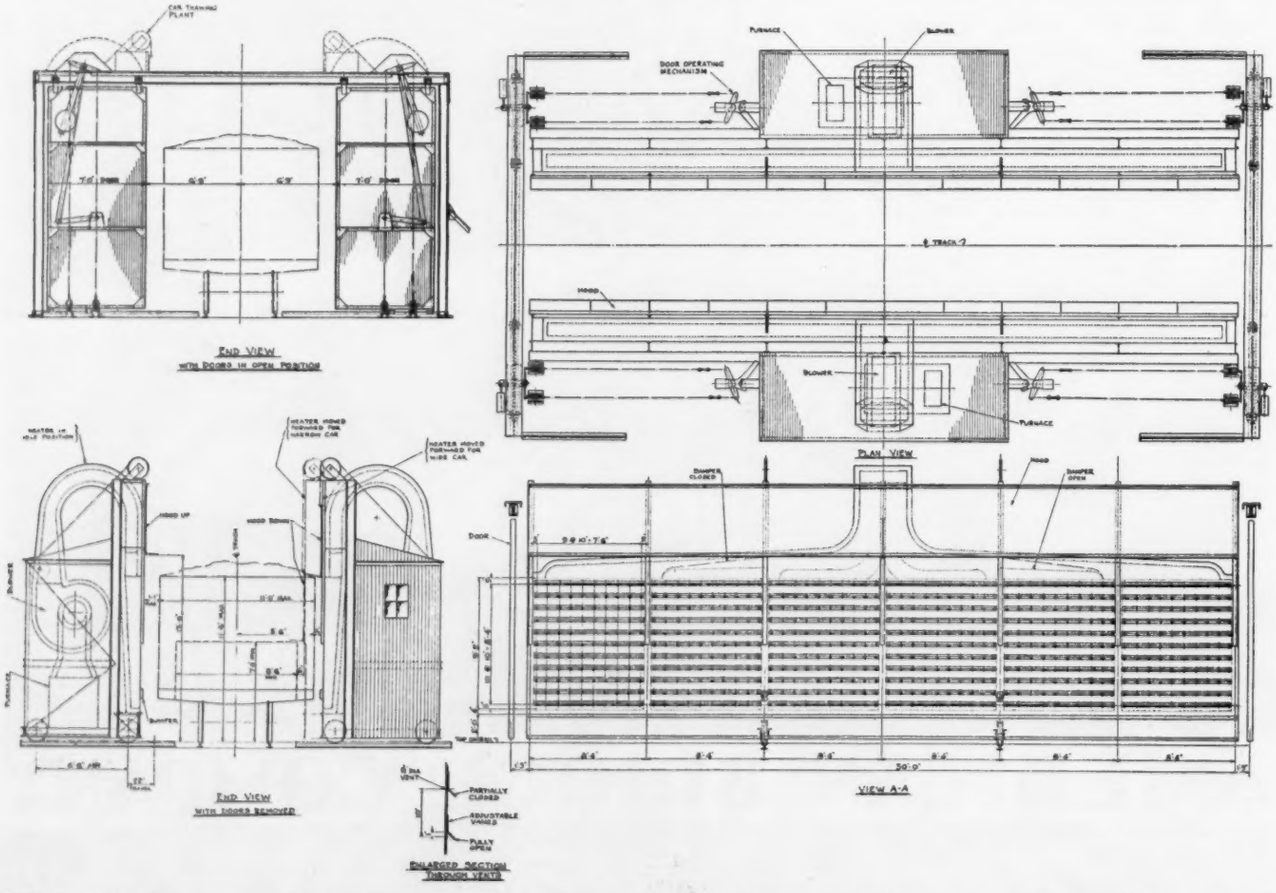
Heat from Oil Furnace

Each unit comprises a structural frame movably mounted and carrying as a heating element a box, approximately 10 feet high and 50 feet long, which is provided with perforated front plates through which the heated air is directed against the side of the car. Heat is supplied by an oil burning furnace from which the products of combustion, mixed with air, are conducted to a blower and through suitable ducts to the heat box.

Sufficient air is mixed with the products of combustion to reduce the temperature to about 350 to 400 degrees Fahr., a temperature much higher than steam, but not sufficient to damage the car. The oil furnace and blower are enclosed and the duct system and heat box are well insulated to prevent heat loss by radiation. A hood also is provided to close the opening between the top of the car and the heat box.

It is estimated that this equipment is capable of thawing a car sufficiently in about 2 minutes so that the contents can be dumped. This operation will require about 35 gallons of oil at 30 degrees Baume per hour. Each minute about 26,000 cubic feet of air at 400 degrees Fahr. will be delivered against the car by the two units.

Typical operation of the thawing equipment will be as follows: The car will be stopped on the approach track between the two units and the car rider will leave the car and press a control button at one end of the heater. This will operate the automatic control. The first motion will be to move both units toward the sides of the car, when the units will stop by means of a limit switch. During this interval the hood will be lowered by a suitable mechanism until the sealing plates engage the top of



Sketch showing arrangement of equipment for thawing open-top railroad cars containing coal. Heat supplied by an oil burning furnace is blown against the sides of the car. The normal time for thawing is about 2 minutes

the car sides where they will be stopped by a limit switch. The end gates will be closed automatically by the movement of the heater units. Heat is applied to the car for a predetermined period, regulated by a time switch, which may be adjusted to periods from 1 to 5 minutes—2 minutes normal. At the end of this period, the operation is automatically reversed, the hood is lifted and the units move away from the car, the gates open and another car can be run in.

The electrical equipment may be adapted to alternating or direct current and will include motors as follows: One blower motor, 20 horsepower; one moving motor, 10 horsepower; one hood motor, 3 horsepower; one air compressor motor, 3 horsepower; one oil pump motor, ½ horsepower. Standard equipment is designed for operation on alternating current at 440 volts, 3 phase, 60 cycles.

The heat ducts and heat boxes will be insulated by a standard rock wool insulating material—approximately 4 inches thick, which will be protected by a galvanized covering properly secured in place. The heat box will be divided into six sections for each unit and each section will be separately insulated, and capable of removal in case repairs are necessary.

Temperature of the outlet heat is controlled accurately by adjustment of dampers in the oil furnace. The perforated face plates of the heat box are provided with deflecting vanes which direct the heat downward. These vanes are adjustable so that the heat will be uniformly distributed.

Adjustable to Car Size

In addition to these adjustments, provision also is made for complete closure of either or both of the end sections in case short cars are being thawed, thus giving effective heating surface 33 to 42 or 50 feet, as desired.

The end gates are of structural steel suspended by door hangers from an overhead track, sufficiently high to clear the car rider. These doors are of light construction, covered with flat steel plates. They are counterweighted and operated by cables and levers connected to the heater units, in such a manner that the first movement of the units closes the gates and the units can move closer together to accommodate narrow cars.

Fuel tanks are provided on each unit, of sufficient capacity to supply fuel for 12 hours continuous operation. Practically no attendance is required after the burners are started.

The equipment is compact and can be installed in a limited space. One of the principal advantages is its flexibility. These units can be installed at the most convenient operaing points, such as at the bottom of the approach incline to a lifting car dumper, or at vantage points in a load yard. When freezing conditions are aggravated, a number of units can be applied easily so that cars may be thawed in progressive stages or the time control can be arranged to permit continuous operation and a car allowed to remain in the heater as long as required to thaw it completely. During summer months, the units may be moved to one side, and stored close together, until cold weather requires their use.

Extreme Pressure Lubricants Afford High Power Transmission Through Bearings

BY C. M. LARSON
Supervising Engineer, Sinclair Refining Co., New York

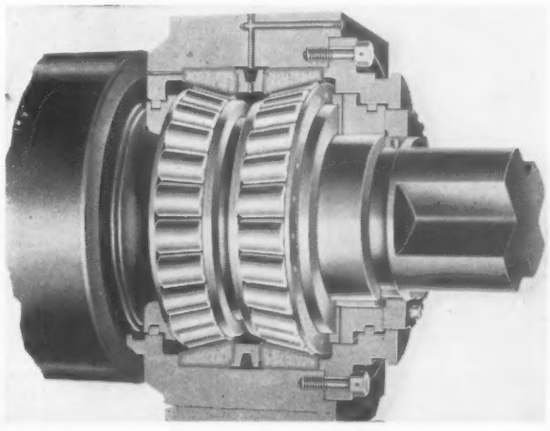
PROPER lubrication of roller bearings for steel mill roll necks is of great importance in that it influences the cost and the quality of production, upkeep of equipment, particularly the bearings, and has a direct connection with continuous operations.

New types of mills with improved bearing design have created a need for extreme pressure lubricants. These mills have been crowded by increasing the reductions per pass as well as the speed. With the introduction of roller bearings on roll necks of such high-speed modern mills, it was possible to utilize high-speed, low-friction, high-film strength (load carrying) lubricants that increase bearing life.

The use of extreme pressure lubricants has opened up a new field in industrial lubrication. During the past 20 years, metallurgists have developed alloy steels capable of withstanding high pressures when used in transmitting power and in carrying loads. Until recently, lubricants had not kept pace with these metallurgical developments. Under operating conditions of high rubbing speeds and high lubricant temperatures, mineral oils and greases are able to withstand pressures of 10,000 to 12,000 pounds per square inch, whereas steel alloys are capable of withstanding as high as 100,000 pounds per square inch. The difference is an indication of what can be accomplished through the use of lubricants capable of withstanding high pressures. With the use of extreme pressure lubricants, five to seven times as much power can be transmitted through the gearing and bearings without increasing the size of the equipment.

The principal requirements of an extreme pressure lubricant for roller bearings are the maintenance of high load-carrying capacities, and absence of any tendency to thicken in service over a reasonable period of time. The extreme pressure ingredient should not be volatile at the operating temperature nor should it decompose or separate from the oil. Furthermore, it should not undergo changes of such a nature that its load carrying capacity is reduced. Sufficient stability is required for slow rates of feed for protection of the roller bearings and economy of lubricant consumption.

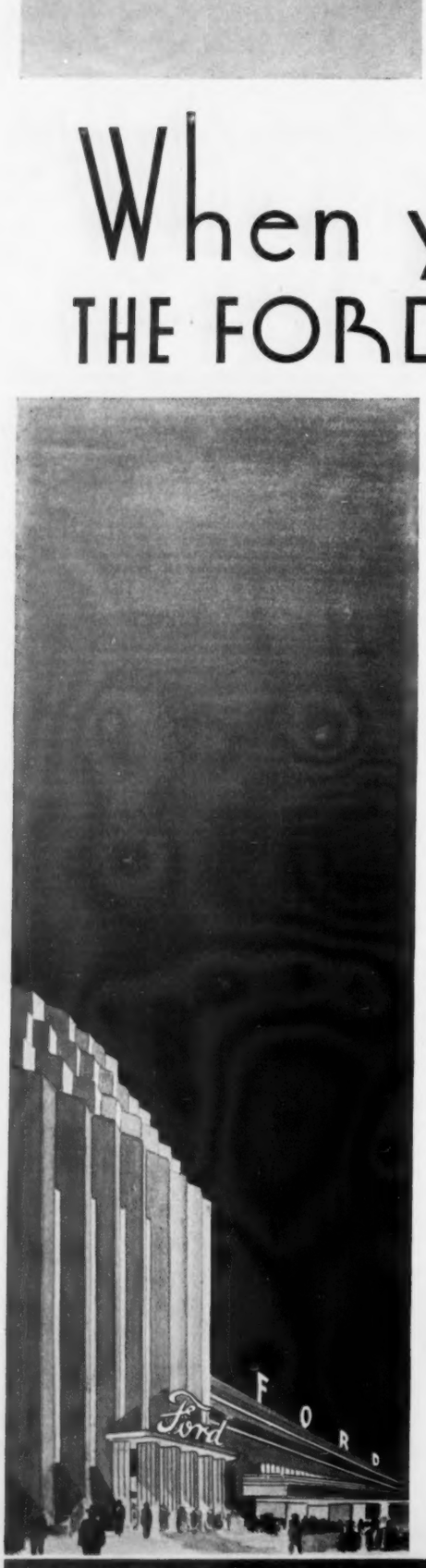
Extreme pressure lubricants should not contain any abrasive material, otherwise excessive wear will occur. Corrosion of steel must be avoided and the composition and consistency should be such as to keep water and scale out and yet the lubricant must be plastic enough to handle in the various modern types of lubricating systems.



ROLLER bearings of this type used on roll necks of modern high-speed mills require extreme pressure lubricants for efficient operation

When you visit THE FORD BUILDING

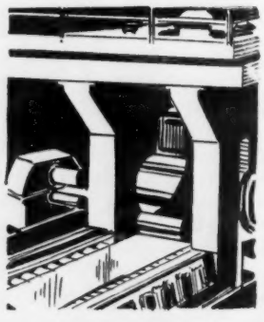
At the Century of Progress



See

U N I T E D ' S

WORKING MODEL OF THE NEW 4-HIGH CONTINUOUS HOT STRIP MILL NOW BEING BUILT FOR THE FORD MOTOR COMPANY.



UNITED

ENGINEERING *and* FOUNDRY COMPANY

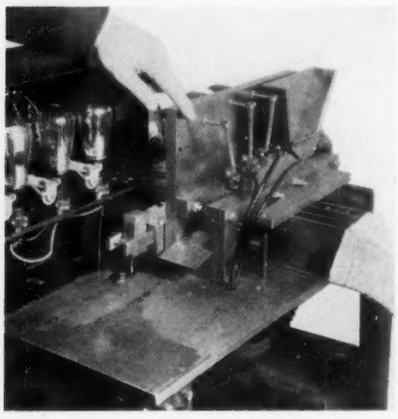
PITTSBURGH — PENNSYLVANIA

THE WORLD'S LARGEST MAKER OF ROLLS AND ROLLING MILL EQUIPMENT

NEW EQUIPMENT

PRODUCTION FABRICATION
TREATMENT FINISHING

Electronic Gaging Machine—R. D. McDill, industrial electronic engineer, 268 Bangor building, 942 Prospect avenue, Cleveland, recently developed a unique electronic gaging machine for diameters. It may be employed for gaging and sorting rolls for roller bearings, screw machine products, etc. Sorting is accomplished at the rate of 100 pieces per minute at an accuracy of 0.00002-inch. The gaging head, shown herewith, is of bridge construction in



Electronic gaging machine for sorting rolls for roller bearings, etc.

which full compensation is made for temperature changes. Products ranging from ⅛ to ¼-inch in diameter and in any length from ¾ to 1¾-inch can be handled. Work is placed in a stacked hopper from which they drop one by one on to a positioning wheel. After being gaged each piece is ejected automatically into the proper bin. Four separations are made. Two bins collect the acceptable pieces while the parts that are above and below the specified size are deposited in the rejection bins.

♦ ♦ ♦

Bench Lathe—South Bend Lathe Works, 426 East Madison street, South Bend, Ind., is bringing out a new back-geared, screw cutting lathe of 9-inch swing, available with counter shaft drive or motor drive. This unit is particularly intended for small machining work. All fundamental machining operations may be performed with this lathe, including the cutting of screw threads, right or left-hand, from 4 to 40 per inch. Mechanical features cover a six-speed back-geared headstock, hollow headstock spindle for handling bar and chuck work, automatic power feed to carriage, ballcrank hand cross feed, graduated compound rest swiveling to any angle, graduated tailstock with set-over for taper turning, and heavy lathe bed having three V-ways and one flat way to insure alignment of headstock, tailstock and carriage.

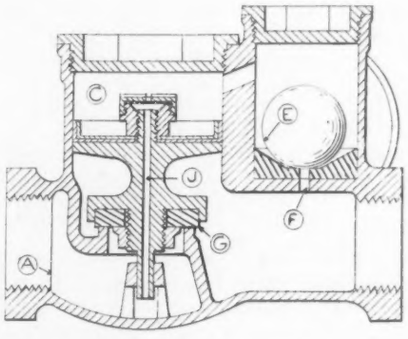
♦ ♦ ♦

Welding Electrode—General Electric Co., Schenectady, N. Y., has added to its line a general purpose welding electrode designated type W-22. It is of the heavily coated type, and produces welds of the quality required for Class 1 pressure vessels according to the A.S.M.E. boiler construction code. A distinctive feature is the fact that it may be used in any position, i. e., for flat, vertical or overhead welding, and at the same time has deep penetrating qualities. It is therefore equally suitable for butt and fillet welds.

♦ ♦ ♦

Valves—Myers Engineering Equipment Co., 401 South Twelfth street, St. Louis, recently brought out an electro-hydraulic valve and an electro-magnetic valve. The unique principle of operation may be observed by referring to the accompanying line drawing of the electro-hydraulic unit. Inlet of the valve is designated by *A*. Electric current is employed to energize a magnet which throws ball *E* off by-pass *F*, relieving pressure in chamber *C*. Bypass *J* being smaller than by-pass *F* causes line pressure to raise seat *G*. It is designed for pressures up to 250 pounds. Sizes available are ¼, ½, ¾ and 1-inch. The coil employed can be wound for any current, high or low voltage. Valves are made to handle ammonia, air, carbon dioxide, steam, water, etc., for almost any condition where a stop valve is needed.

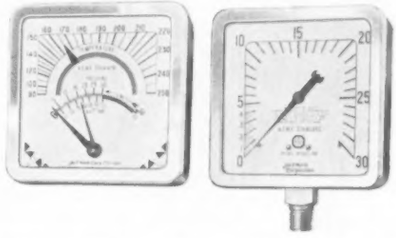
The electro-magnetic valve fil's a need for a small, compact, electrically-operated valve for remote control of oil, gas, air, refrigerant and water lines. A magnet is employed, which when energized pulls the ball from the valve seat horizontally and holds it against a metal divisional wall between the magnet and the valve body. When the current is turned off the ball rolls back on the seat, thus closing the valve. For oil or non-corrosive service a steel ball is employed, but for severe conditions special stainless steel balls are recommended.



Electro-hydraulic valve marketed by Myers Engineering Equipment Co.

♦ ♦ ♦

Gages—Jas. P. Marsh Corp., 2073 Southport avenue, Chicago, has brought out a new line of gages mounted in a modern design of square case and available in a wide variety of pressure applications. These instruments, shown herewith, are made in one size—3½-inch dial. They can be supplied with dial reading in pressure, vacuum, feet of water or in practically any type of pressure reading desired. They also are available in standard low pressure steam graduations, as well as in a combination instrument in which the temperature, pressure and feet



New line of Marsh gages mounted in a square case of modern design

of water are shown on the same dial. The instruments can be supplied with lower connection for mounting directly on top of apparatus, with rear connection for application to the side or front, or for flush mounting inside of the jacket. A wide variety of finishes are available.

♦ ♦ ♦

Indicating Controller—Brown Instrument Co., Philadelphia, recently announced a new automatic control indicating thermometer in which the use of mercury switches to eliminate open make-and-break contacts controlled by the pointer is a revolutionary feature. In this device, every six seconds a motor-driven control table determines the location of the pointer in reference to the control setting, and tilts the mercury switch from one side to the other if the temperature has changed.

With this unique system, the measuring mechanism is free to position itself, unhampered by the control mechanism. There is no excess

weight on the pointer, no distortion or restriction of pointer movement. The mercury switches have capacities up to 15 amperes at 110 volts (10 amperes at 220 volts), thus eliminating external relays in most ap-

Indicating thermometer controller developed by Brown Instrument Co.

plications. All models of this controller are furnished in circular 10-inch universal cases. The new unit is equally adaptable for control of pressure, liquid level, and similar factors, as well as temperature. The device is shown above.

♦ ♦ ♦

Knife Grinder—Samuel C. Rogers & Co., 191-205 Dutton avenue, Buffalo, is placing on the market a new knife grinder with electric time clock control. Power is cut off automatically and the grinder stopped when the knife is sharp. The clock can be set to stop the process at the end of any period from 1 to 45 minutes. The knife table is provided with holding clamps, bolts and is fitted with gages for rapid setup.

♦ ♦ ♦

Centrifugal Pumps—Novo Engine Co., Lansing, Mich., recently introduced a new line of self-priming centrifugal pumps. A new principle is employed whereby air is exhausted more rapidly from the suction line, accomplished by injecting air into the recirculating water flowing at high velocity. Result is a faster prime and higher head, it is claimed. The new units are built in four sizes, 2, 3, 4, 5 and 6-inch, which give 10,000, 20,000, 40,000 and 90,000 gallons per hour respectively.

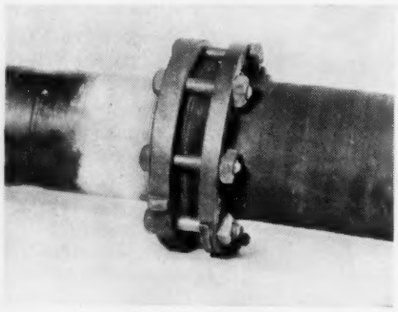
♦ ♦ ♦

Blueprint Machine—Shaw Blue Print Machine Co. Inc., Newark, N. J., recently brought out a new model E unit. It is a 42-inch horizontal, continuous printer, equipped with GE mercury vapor tube lamps. The design provides versatile equipment for reproduction of blueprints, vandyke negatives, blueline prints, direct black and white prints or ozalid prints. A ⅛-horsepower motor furnishes power for driving the endless canvas band, and a variable speed control at the right-hand side of the machine gives a speed ratio of from 6 inches to 5 lineal feet per minute.

♦ ♦ ♦

Hose Joint—B. F. Goodrich Co., Akron, O., recently brought out a new hose joint that eliminates all contact between metal and fluid. This construction, shown herewith, is said to permit greater flexibility and affords a perfect seal in all suction and discharge service up to 125 pounds working pressure. The joint is recommended particularly for the larger diameter of suction or discharge hose handling abrasive materials and hose handling acid or other corrosive liquids.

The unique end built into the hose



Goodrich hose joint eliminates contact between metal and fluid

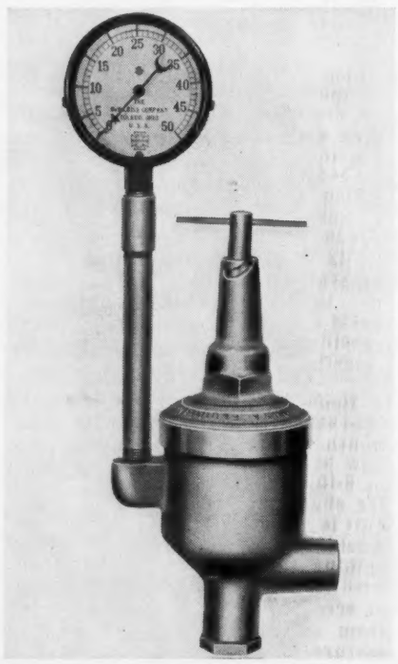
consists of an enlargement or bead, reinforced with numerous plies of fabric surrounding a rigid steel ring of angular cross section. The joint is assembled with the aid of split flanges and standard bolts. Two successive lengths of hose thus can be bolted together with the rubber ends of the hose compressed to form a seal. Spacing of the bolt holes is standard so that the end of the hose can be fitted to the end of a standard pipe. When the bolts are drawn up the pressure of the split flange against the flared hose end provides an unyielding clamping of the joint. The joints are furnished in sizes 1½ inches and up.

♦ ♦ ♦

Honing Machine—Barnes Drill Co., 814 Chestnut street, Rockford, Ill., is building a small hydraulically reciprocated honer. It is fitted with an electrically controlled stroke counter which not only predetermines the number of strokes but also provides for an automatic approach into the work, automatic assumption of the honing or work stroke, and automatic spindle return when the predetermined number of strokes has been accomplished, according to the setting of the stroke counter. Design of the fixture and of this particular type of unit has made possible the honing of bores in steel gear blanks where the thickness may not exceed the diameter of the bore.

♦ ♦ ♦

Fluid Regulator—DeVilbiss Co., Toledo, O., has brought out a new type of fluid regulator, shown herewith. Designed for use with circulating systems, it assures constant and correct fluid pressure at each spray gun. Consequently the gun farthest from the pumps is fed at the same fluid flow and pressure as the nearest spray gun. The "blow back" feature is included in this type HG regulator. If the valve is opened while the operator cleans his hose by blocking off the air at the nozzle, the air and paint ahead of it will be blown back through the units. The regulator screw, a removable key, locks it at the desired pressure and eliminates tampering. Valve stem and valve seat are of hardened stainless steel with both seats ground to a perfect seal, to insure long lift and severe usage. Available with 50-pound pressure gage with 6-inch tube, or without gage or tube.



DeVilbiss fluid regulator assures constant pressure at each spray gun

Steel Rate Off to 57, Labor Issue Dominating

Heavy Stocks of Consumer Goods and Materials Depressing Factor—Automobile Production Makes Slight Improvement—Scrap Continues Downward

LABOR dissensions continue the dominating influence in the iron and steel markets, the trend of which is reflected by further moderate reduction in production, steelworks operations last week declining 2 points to 57 per cent.

Specifications from some of the leading consumers have declined because they have been stocking heavily over recent weeks in anticipation of strikes and possible interruption in delivery of material. Automobile partsmakers especially have been cautious through fear of being caught with excessive inventories, in the event automobile manufacturers themselves are forced to more serious curtailment in production.

June 16 has now been set by the Amalgamated Association of Iron, Steel and Tin Workers for a strike if its demands for recognition are refused, and this refusal now appears certain. However, the strength of the Amalgamated association is such an uncertain quantity that the industry as a whole entertains no serious misgivings concerning a strike's effectiveness.

Automobile production last week made a slight gain over the preceding week, and specifications direct from the largest manufacturers increased moderately, enabling sheet and stripmakers to improve their operating schedules. At Pittsburgh, sheet mill output rose 5 points to 75 to 80 per cent. In general, the volume of steel specifications received by leading interests for shipment in May approximate the tonnage moved in April.

Railroad Equipment Builders Taking More Material; Structural Awards Lower

While railroad purchases in the week were limited mainly to 2739 tons of rails by the Nickel Plate railroad, rail production at Chicago held at 40 per cent, and releases of material for equipment building and repair showed further improvement. To the effect of the drouth in the western states is attributed a decline in steel demand from agricultural implement builders.

Structural steel awards for the week dropped slightly to 14,285 tons, including 2500 tons for two buildings in the Rockefeller Center, New York. The Ford Motor Co. is to take bids shortly on 5000 tons of shapes for a strip mill building at Dearborn, Mich., and the Semet-Solvay Co. on 4000 tons for a plant to be located either at Baton Rouge, La., or Freeport, Tex. Among the largest structural projects pending are government dams in Oregon and Washington, bids going in soon on 41,000 tons of steel for the Grand Coulee dam in Washington. The government is planning 13 more large dams in the western states.

Scrap Prices Continue Downward; Few Steel Price Revisions for June 1

Scrap prices continue to reflect the general uncertainties in the market, melters reducing their inventories. Prices at Pittsburgh and Detroit are off 50 cents to $1 a ton, and STEEL's iron and steel scrap composite is down 50 cents to $10.71, the lowest point reached since last December. Pig iron shipments still are on the upgrade, and in the middle western states average 20 to 30 per cent over the April tonnage.

This week, June 1, iron and steel producers will open their books for third quarter on practically all products at unchanged prices. Mill quantity extras on plates, shapes and bars probably will go in effect June 1. A revision in the method of quoting boiler tubes contemplates placing prices on a lineal foot basis, also with some changes in the list of extras. Steel piling was advanced $3 a ton, effective May 25. This was among the increases first announced last April, but due to the large number of outstanding "protections" at the former price it was canceled.

Steelworks operations last week in the Pittsburgh district held at 51 per cent; Cleveland, 78; Detroit, 100; New England, 84; Wheeling, 74; and eastern Pennsylvania, 45. They were down 16 points to 50 per cent at Buffalo; 2 to 62, Chicago; 1 to 61, Youngstown; and increased 1½ to 55 per cent at Birmingham.

Tin plate mill operations in the Pittsburgh district again rose 5 points to 80 per cent, recovering all the ground recently lost, though specifications for tin plate from canmakers still are declining.

STEEL's iron and steel price composite holds at $34.77, and the finished steel index $54.80.

COMPOSITE MARKET AVERAGES

	May 26	May 19	One Month Ago April, 1934	Three Months Ago Feb., 1934	One Year Ago May, 1933	Ten Years Ago May, 1924
Iron and Steel Composite	$34.77	$34.77	$34.18	$32.42	$28.45	$41.38
Finished Steel Composite	54.80	54.80	53.90	51.10	45.10	64.93
Steelworks Scrap Composite	10.71	11.21	12.15	11.72	9.23	10.91

Iron and Steel Composite:—Pig iron, billets, slabs, sheet bars, wire rods, tin plate, nails, sheets, plates, shapes, bars, and black pipe. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

A COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

	May 26, 1934	April 1934	Feb. 1934	May 1933
Finished Material				
Steel bars, Pittsburgh	1.90	1.85	1.75	1.60
Steel bars, Chicago	1.95	1.90	1.80	1.70
Steel bars Philadelphia	2.19	2.15¼	2.04	1.91
Iron bars, Terre Haute, Ind.	1.75	1.60	1.60	1.65
Shapes, Pittsburgh	1.85	1.80	1.70	1.60
Shapes, Philadelphia	2.05½	2.01¾	1.90½	1.65
Shapes, Chicago	1.90	1.85	1.75	1.70
Tank plates, Pittsburgh	1.85	1.80	1.70	1.50
Tank plates, Philadelphia	2.03½	1.99¾	1.88½	1.49½
Tank plates, Chicago	1.90	1.85	1.75	1.70
Sheets, No. 10, hot rolled, Pitts.	2.00	1.90	1.75	1.55
Sheets, No. 24, hot ann., Pitts.	2.65	2.50	2.25	2.00
Sheets, No. 24, galvan., Pitts.	3.25	3.10	2.85	2.70
Sheets, No. 10, hot rolled, Gary	2.10	2.05	1.85	1.75
Sheets, No. 24, hot anneal., Gary	2.75	2.65	2.35	2.15
Sheets, No. 24, galvan., Gary	3.35	3.25	2.95	2.80
Plain wire, Pittsburgh	2.30	2.25	2.20	2.10
Tin plate, per base box, Pitts.	5.25	5.25	5.25	4.25
Wire nails, Pittsburgh	2.60	2.50	2.35	1.85
Semifinished Material				
Sheet bars, open-hearth, Youngs.	30.00	28.40	26.00	26.00
Sheet bars, open-hearth, Pitts.	30.00	28.40	26.00	26.00
Billets, open-hearth, Pittsburgh	29.00	27.80	26.00	26.00
Wire rods, Pittsburgh	38.00	37.20	36.00	35.00

	May 26, 1934	April 1934	Feb. 1934	May 1933
Pig Iron				
Bessemer, del. Pittsburgh	19.76	19.56	19.26	16.66
Basic, Valley	18.00	17.60	17.00	14.40
Basic, eastern, del. eastern Pa.	19.76	19.51	18.76	15.44
No. 2 foundry, del. Pittsburgh	19.26	19.06	18.76	16.16
No. 2 foundry, Chicago	18.50	18.25	17.50	15.90
Southern, No. 2, Birmingham	14.50	14.25	13.50	12.00
No. 2X, Eastern, del. Philadelphia	20.63	20.38	19.63	15.95
Malleable, Valley	18.50	18.10	17.50	14.90
Malleable, Chicago	18.50	18.25	17.50	15.90
Lake Superior charcoal, del. Chi.	23.54	23.54	23.54	23.04
Gray forge, del. Pittsburgh	18.88	18.68	18.38	16.03
Ferromanganese, del. Pittsburgh	90.24	90.24	90.24	73.24
Scrap				
Heavy melting steel, Pittsburgh	$12.00	14.15	13.90	11.65
Heavy melting steel, eastern Pa.	10.50	11.50	11.75	9.50
Heavy melting steel, Chicago	10.75	11.75	10.90	8.70
No. 1 wrought, eastern Pa.	11.25	12.25	12.75	10.25
No. 1 wrought, Chicago	10.35	10.90	10.50	8.10
Rails for rolling, Chicago	12.25	12.75	11.90	10.25
Coke				
Connellsville, furnace, ovens	3.60	3.30	3.50	1.75
Connellsville, foundry, ovens	4.60	4.55	4.25	2.25

Steel, Iron, Raw Material and Metals Prices

Prices conform to American Iron and Steel institute schedules. Asterisks denote price changes this week

Sheet Steel

HOT ROLLED No. 10
(24 to 48 inches wide)

Pittsburgh, base	2.00c
Gary, base	2.10c
Chicago, del.	2.13c
New York, del.	2.33c
Philadelphia, del.	2.29c
Birmingham, base.	2.15c
St. Louis, del.	2.32c
F.o.b. cars, dock Pacific ports	2.55c

HOT ROLLED ANN. No. 24

Pittsburgh, base	2.65c
Gary, base	2.75c
Chicago, del.	2.78c
Detroit, del.	2.85c
New York, del.	2.98c
Philadelphia, del.	2.94c
Birmingham, base.	2.80c
St. Louis, del.	2.97c
F.o.b. cars, dock, Pacific ports	3.25c

GALVANIZED No. 24

Pittsburgh, base	3.25c
Gary, base	3.35c
Chicago, del.	3.38c
Philadelphia, del.	3.54c
New York, del.	3.58c
Birmingham, base.	3.40c
St. Louis, del.	3.57c
San Francisco, f.o.b. cars, dock	3.85c

TIN MILL BLACK No. 28

Pittsburgh, base	2.85c
Gary, base	2.95c
St. Louis, del.	3.17c

COLD ROLLED No. 10

Pittsburgh, base	2.55c
Gary, base	2.65c
Detroit, delivered	2.75c
Philadelphia, del.	2.84c
New York, del.	2.88c
F.o.b. cars, dock, Pacific ports	3.25c

COLD ROLLED No. 20

Pittsburgh, base	3.15c
Gary, base	3.25c
Detroit, delivered	3.35c
Philadelphia, del.	3.44c
New York, del.	3.48c

ENAMELING SHEETS

Pittsburgh, No. 10	2.60c
Pittsburgh, No. 20	3.20c

Tin and Terne Plate

Per 100-lb. box, Pittsburgh. Gary base, 10 cents higher

Tin plate, coke base contract	$5.25
Do., stock	4.90c
Long ternes, No. 24 unassorted	3.65c

Corrosion and Heat Resistant Alloys

Base, Pittsburgh

18% chrome, 8% nickel; sheets, 35c; plates, 28c; bars, 24c; hot-rolled strip, 24.50c; cold-rolled strip, 32.00c.

	A	B	C	D
Bars	17c	18.5c	21c	26c
Plates	20c	21.5c	24c	29c
Sheets	25c	28c	31c	35c
Hot strip	17c	18.5c	21c	26c
Cold strip	22.5c	24c	27c	35c

Carbon 0.12 and under; no nickel. A has chrome 15% and under. B over 15/18% inc., C over 19/23% inc., D over 23/30%.

Steel Plates

Pittsburgh, base	1.85c
New York, del.	2.13c
Philadelphia, del.	2.03½c
Boston, del.	2.25c
Buffalo, del.	2.08½c
Chicago or Gary, base	1.90c
Cleveland, del.	2.03½c
Birmingham, base.	2.00c
Coatesville, base	1.95c
Sparrows Pt., base.	1.95c
Pacific Coast, f.o.b. cars, dock	2.40c
St. Louis, del.	2.12c

Structural Shapes

Pittsburgh, base	1.85c
Philadelphia, del.	2.05½c
New York del.	2.10½c
Boston, del.	2.23½c
Bethlehem, base	1.95c
Chicago, base	1.90c
Cleveland, del.	2.03½c
Buffalo, base	1.90c
Gulf ports	2.25c
Birmingham, base.	2.00c
Pacific Coast, f.o.b. cars, dock	2.40c

Bars

SOFT STEEL

Pittsburgh, base	1.90c
Chicago or Gary, base	1.95c
Birmingham, base.	2.05c
Buffalo, base	2.00c
Cleveland, base	1.95c
Detroit, del.	2.05c
Pacific Coast ports cars, dock, c.i.f.	2.45c
Philadelphia, del.	2.19c
Boston, del.	2.30c
New York, del.	2.23c
Pitts., forg. qual	2.05c-2.55c

RAIL STEEL
To Manufacturing Trade

Pittsburgh base	1.80c
Chicago or Gary, base	1.85c
Cleveland, base	1.85c
Buffalo, base	1.90c

IRON

Terre Haute, Ind. base	1.75c
Philadelphia, base..	1.99c
Pittsburgh, refined..	2.75c-7.50c

REINFORCING
New billet, cut lengths, carlots

Pittsburgh	2.05c
Chicago, Gary, Buffalo, Cleve., Birm., Young....	2.10c
Gulf ports	2.45c
Pacific coast ports	3.00c
Philadelphia, del.	2.34c

Rail Steel

Pittsburgh, base	1.90c
Chicago, Buffalo, Cleveland, Birm., Young	1.95c
Gulf ports	2.30c
Pacific coast ports	2.45c

Wire Products □ □

(Prices apply to straight or mixed carloads; pool cars, or less, 10c up. 10% dis. on nail extras on straight or mixed carloads to one consignee.)

Base, Pittsburgh-Cleveland
(Per 100-lb. keg)

Standard wire nails	$2.60
Cement coated nails	2.60
Galvanized nails, 15 gage and coarser	4.60c
Do., 16 gage and finer..	5.10c

(Per pound)

Polished staples	3.30c
Galvanized fence staples	3.55c
Barbed wire, galv.	3.00c
Annealed fence wire	2.45c
Galvanized fence wire	2.80c
Woven wire fencing (base column, c.l.)	$63.00
Plain wire, 6-9 gage to mfg. trade	2.30c

Anderson, Ind., Chicago up $1; Duluth up $2; Birmingham up $3.

Spring wire	3.20c

Chicago and Waukegan $1 higher, Worcester $2 higher.

Cold-Finished Carbon Bars

Base Pitts., one size, shape, grade, shipment at one time to one destination

10,000 to 19,999 lbs.	2.10c
20,000 to 59,999 lbs.	2.05c
60,000 to 99,999 lbs.	2.00c
100,000 lbs. and over	1.97½c

Chicago, Cleveland, up 5c; Buffalo, up 10c; Detroit, up 20c; eastern Michigan, up 25c.

Shafting □ □ □

Turned and ground, Pitts. base	
1⅛-inch	3.40c
1⅞ to 1½-inch	2.90c
1⅞ to 1⅞-inch	2.75c
1⅛ to 2⅞-inch	2.60c
2⅛ to 7-inch	2.45c

Alloy Steel Bars □

Hot Rolled

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem	2.55c

Alloy S.A.E.	Diff.	Alloy S.A.E.	Diff.
2000	0.25	3100	0.55
2100	0.55	3200	1.35
2300	1.50	3300	3.80
2500	2.25	3400	3.20

4100 .15 to .25 Mo.	0.50
4600 .20 to .30 Mo. 1.75 Ni.	1.05
5100 .80-1.10 Cr.	0.45
5100 Cr. spring	base
6100 bars	1.20
6100 spring	0.70
Cr., Ni., Van.	1.50
Carbon van.	0.95
9250	carbon base plus extras

Strip and Hoops □

Hot strip to 23⅛-in. Pittsburgh	2.00c
Do., Chicago	2.10c
Do., del. Detroit..	2.20c
Do., del. Phila.	2.29c
Do., del. N. Y.	2.33c
Cooperage hoop, Pittsburgh	2.10c
Do., Chicago	2.20c
Cold-rolled strip, Pitts., Cleve.	2.80c
Worcester, Mass.	3.00c

Rails, Track Material □

(Gross Tons)

Standard rails, mill	$36.37½
Relay rails, Pitts. 24-45 lbs.	$26.00
50-60 lbs.	$23.00
70-75 lbs.	$18.00
80-85 lbs.	$25.00
100 lbs.	$26.00
Light rails, billet qual., Pitts., Chi..	$35.00
Do., reroll. qual...	$34.00
Angle bars, mills	2.55c
Spikes, R. R. base..	2.40c
Track bolts, base	3.55c
Tie plates, base	1.90c

Base, light rails 25 to 40 lbs.; 50 to 60 lbs. inclusive up $5; 16 and 20 lbs., up $1; 12 lbs., up $8; 8 and 10 lbs., up $5. Base railroad spikes 200 kegs or more; base tie plates 20 tons or more; diff. for less.

Bolts and Nuts □ □

Pittsburgh, Cleveland, Birmingham, Chicago. Discounts to legitimate trade for all case lots. Dec. 1, 1932, lists.

CARRIAGE BOLTS

All sizes, cut thread	70 off
Rolled thread, ½ x 6 and smaller	70 off

MACHINE BOLTS
All sizes, cut thread, lag

Screws, plow bolts, Nos. 1-2-3-7 heads, tap bolts, blank bolts, stud bolts, without nuts	70 off
Tire bolts	60 off
Stove bolts, 70-25-10 off in pkgs.; 83 off in bulk, 5000 or more of a size.	
Rolled thread machine bolts, ½ x 6 and smaller,	70 off
Step bolts	66 off
Elevator bolts	66 off

NUTS

Semifinished	70 off

HEXAGON CAP SCREWS

Milled	80-10-10 off
Upset 1-in., smaller	85 off

SQUARE HEAD SET SCREWS

Upset, 1-in., smaller	75-10 off
Upset, larger than 1-in.	75-10 off
Headless set screws	75 off

Rivets, Wrought Washers

Struc., c. l., Pittsburgh, Cleveland	3.00c
Struc., c. l., Chicago	3.10c
⅞-in. and smaller, Pitts., Chi., Cleve.	70 and 5 off
Wrought washers, * Pitts., Chi., Phila..	6.00 off

Cut Nails, Piling □

Cut nails, Pitts.; (10% discount on size extras)	$2.75
Do. less carloads, 5 kegs or more, no discount on size extras	$3.05
Do. less than 5 kegs; no discount on size extras	$3.20
*Steel piling, Pittsburgh..	2.15c
*Steel piling, Chi., Buff....	2.25c

Pipe and Tubing

Base $200 net ton, except on standard commercial seamless boiler tubes under 2 inches and cold drawn seamless tubing.

Welded Iron, Steel Pipe

Base discounts on steel pipe, Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less. Chicago delivered 2½ points less. Wrought pipe, Pittsburgh base.

BUTT WELD
Steel

In.	Blk.	Gal.
¼ and ⅜	53½	35
½	58½	47
¾	62	52
1—3	64	55

Iron

½	31½	15
¾	36½	20½
1—1¼	39½	25½
2	41½	26

LAP WELD
Steel

2	60	51
2½—3	63	54
3½—6	65	56
7 and 8	64	54
9 and 10	63½	53½

Iron

2	37	22½
2½—3½	38	25
4—8	40	28½

LINE PIPE
Steel

⅛-inch, butt weld	50½
¼—⅜, buttweld	52½
½, butt weld	57½
¾, butt weld	61
1—3, butt weld	63
2-inch, lap weld	59
2½—3, lap weld	62
3½—6, lap weld	64
7—8, lap weld	63

Iron

⅛—1½-inch, black and galv. take 4 pts. over; 2½—6-inch 2 pts. over discounts for same sizes, standard pipe lists. 8—12-inch, no extra.

BOILER TUBES
C. L. Discounts, f.o.b. Pitts.

Lap Weld Steel		*Charcoal Iron*	
2—2¼	33	1¾	8
2½—2¾	40	2—2¼	13
3	47	2½—2¾	16
3¼—3½	50	3	17
4	52	3¾—3½	18
4½—5	42	4	20
		4½	21

In lots of a carload or more, above discounts subject to preferential of two 5% and one 7½% discount on steel and 10% on charcoal iron.

Lapwelded steel: 2000 to 9999 pounds, ten points under base, one 5% and one 7½%. Under 2000 pounds 15 points under base, one 5% and one 7½%. Charcoal iron: 10,000 pounds to carloads, base less 5%; under 10,000 pounds, two points under base only.

SEAMLESS BOILER TUBES
Cold Drawn

2—2¼	27	3¼—3½	41
2½—2¾	34	4	43
3	38	4½, 5, 6	36

(On 1—1¾-inch sizes mechanical tubing dis. apply.)
Hot Rolled

2—2¼	33	3¼—3½	47
2½—2¾	40	4	49
3	44	4½, 5, 6	42

Quantity discounts: Carload and more gets preferentials of two 5%; 2000 to 999 pounds, 10 points off base and one 5%, under 2000 pounds, 15 points under base and one 5%.

Seamless Tubing □

Cold drawn; f.o.b. mill disc.

100 ft. or 150 lbs.	32%
15,000 ft. or 22,500 lbs.	70%

Cast Iron Water Pipe □

Class B Pipe—Per Net Ton

6-in., & over, Birm.	$36.00-37.00
4-in., Birmingham..	39.00-40.00
4-in., Chicago	47.00-48.00
6 to 24-in., Chicago	44.00-45.00
6-in., & over, east. fdy.	40.00
Do., 4-in.	43.00

Class A pipe $3 over Class B. Stnd. fitgs., Birm. base....$90.00

Six to 24-inch, fittings, base; over 24-inch plus $20; 4-inch, plus $10; 3-inch, plus $20; gas pipe fittings, 5 higher.

Semifinished Steel □

Prices Per Gross Ton

BILLETS AND BLOOMS
4 x 4-inch base

Pitts., Chi., Cleve., and Youngstown..	$29.00
Philadelphia	34.30
Forging, Pitts., Chi. and Buffalo	34.00

SHEET BARS

Pitts., Cleve., Young., Chi., Buff., Canton, O.	30.00

SLABS

Pitts., Cleve., Young.	29.00

WIRE RODS

Pitts., Cleveland	38.00
Chicago	39.00

SKELP

All grades, Pitts. and Chicago	1.70c

Coke □ □ □

Price Per Net Ton

BEEHIVE OVENS

Connellsville fur.	3.60- 3.85
Connellsville fdry.	4.60
Connell. prem. fdy.	5.35
New River fdry.	6.00
Wise county fdry.	4.25- 5.00
Wise county fur.	3.50- 4.25

BY-PRODUCT FOUNDRY

Newark, N. J., del.	8.71- 9.31
Chi., ov., outside del.	8.50
Chicago, del.	9.25
New England, del.	10.50
St. Louis, del.	9.25
Birmingham, ovens	5.50
Indianapolis, del.	8.75
Cincinnati, del.	9.30
Cleveland, del.	9.25
Buffalo, ovens	7.50- 8.00
Detroit, ovens	8.50
Philadelphia, del.	9.00

Coke By-Products □

Per gallon, producers' plants.
Tank lots

	Spot
Pure benzol	$0.19
90 per cent benzol	$0.19
Toluol	0.30
Solvent naphtha	0.26
Commercial xylol	0.26

Per lb. f.o.b. New York

Phenol (200 lb. drums)..	0.163c
Do. (100 lbs.)	0.173c

Eastern Plants, Per Pound, In Barrels

†Naphthalene flakes and balls	6.00

Per 100 lb. Atlantic seaboard

Sulphate of ammonia	$1.25

†Western prices ½-cent up.

Pig Iron

Delivered prices do not include switching charges except as noted. No. 2 foundry iron is 1.75-2.25 silicon; 25-cent differentials apply for each 0.25 silicon above 2.25. Gross tons.

	No. 2 Fdry.	Malleable	Basic	Bessemer
Basing Points:				
Bethlehem, Pa.	$19.50	$20.00	$19.00	$20.50
Birdsboro, Pa.	19.50	20.00	19.00	20.50
Swedeland, Pa.	19.50	20.00	19.00	20.50
Sparrows Point, Md.	19.50	.....	19.00	.....
From Swedeland, Pa., del. to Phila.	20.26	20.76	19.76	.....
From Bethlehem, del. to Brooklyn	21.77	22.27	.....	.....
From Bethlehem, del. to Newark, N. J.	20.89	21.39	.....	.....
Basing Point:				
Everett, Mass.	19.50	20.00	19.00	20.50
From Everett, del. to Boston	20.00	20.50	19.50	21.00
Basing Point:				
Buffalo	18.50	19.00	17.50	19.50
From Buffalo, del. to Boston	20.00	20.50	19.50	21.00
Basing Points:				
Neville Island, Pa.	18.50	18.50	18.00	19.00
Sharpsville, Pa.	18.50	18.50	18.00	19.00
Youngstown, O.	18.50	18.50	18.00	19.00
From Neville Island, Pa., del. to Pittsburgh district	(Neville Island base, plus 63c to $1.13 switching charges)			
Basing Points:				
Erie, Pa.	18.50	19.00	18.00	19.50
Cleveland	18.50	18.50	18.00	19.00
Toledo, O.	18.50	18.50	18.00	19.00
Detroit	18.50	18.50	18.00	19.00
From Detroit, del. to Saginaw, Mich.	20.60	20.60	20.10	21.10
From Cleveland, del. to Akron, Canton, O.	19.76	19.76	19.26	20.26
From Toledo, del. to Mansfield, O.	20.26	20.26	19.76	20.76
Basing Point:				
Jackson, O.	20.25	20.25	19.75	.....
Hamilton, O.	18.50	18.50	18.00	.....
From Hamilton, del. to Cincinnati	19.51	19.51	19.01	.....
Do., del. to Indianapolis	20.77	20.77	20.27	21.27
Basing Points:				
Duluth	19.00	19.00	.....	19.50
Chicago	18.50	18.50	18.00	19.00
Granite City, Ill.	18.50	19.00	18.00	.....
From Duluth, del. to St. Paul	20.94	20.94	.....	21.44
From Chicago, del. to Milwaukee	19.50	19.50	19.00	20.00
From Chicago, Toledo or Detroit, del. to Muskegon, Mich.	21.40	21.40	20.90	21.90
From Granite City, del. to St. Louis	19.00	19.50	18.50	.....
Basing Point:				
†Birmingham, Ala.	14.50	.....	13.50	19.00
From Birmingham, del. to:				
Boston	19.62	.....	19.50	.....
Newark, N. J.	20.51	.....	.....	.....
Brooklyn, N. Y.	21.39	.....	.....	.....
Baltimore	20.02	.....	19.90	.....
Philadelphia	19.88	.....	19.76	.....
Cleveland	18.62	.....	18.50	.....
Cincinnati	19.13	.....	19.01	.....
Chicago	††18.72	.....	18.60	.....
St. Louis	18.62	.....	18.50	.....

†Southern delivery only. Prices at northern points are adjusted to quotations on northern iron. ††Over 0.70 phos.

Basing Point:
Provo, Utah ..... 17.50 ..... 17.00 .....

LOW PHOS.

Basing Points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y.—$23.50. Basing Point: †Johnson City, Tenn.—$23.50
†Off grade material is $19.50

Philadelphia, standard and copper bearing 24.63

GRAY FORGE		CHARCOAL	
Valley furnace	17.25	Lake Superior fur.	21.00
Pitts. dist. fur.	17.75	Do., del. Chicago	24.04

SILVERY

Jackson County, O., base; 6%—$22.75; 7—$23.75; 8—$24.75; 9—$25.75; 10—$26.75; 11—$27.75.

BESSEMER FERROSILICON

Jackson County, O., base; 10%—$27.75; 11—$28.75; 12—$30.25; 13—$31.75; 14—$33.25; 15—$34.75; 16—$36.25.

Iron Ore

LAKE SUPERIOR ORE
Gross ton, 51½% Lower Lake Ports

Old range bessemer	$4.80
Mesabi nonbess.	4.50
High phosphorus	4.40
Mesabi bessemer	4.65
Old range nonbess.	4.65

EASTERN LOCAL ORES
Cents, unit, del. E. Pa.

Foundry and basic, 56-63% con. (nom.)	8.00- 9.00
Cop.-free low phos. 58-60% (nom.)	10.00-10.50

FOREIGN ORE
Cents per unit, f.a.s. Atlantic ports (nominal)

Foreign manganiferous ore, 45.55% iron, 6-10% man.	10.00
No. Afr. & low phos.	9.50
Swedish basic, 65%	9.00
Swedish low phos...	9.50
Spanish No. Africa basic, 50 to 60%..	9.00
Tungsten, spot, sh. ton unit, duty pd.	$17.25-17.75
N. F. fdy., 55%.....	7.00
Chrome ore, 48% gross ton, c.i.f.....	$18.00

Manganese Ore

(Nominal)

Prices, not including duty, cents per unit, cargo lots.

Caucasian, 52-55%	24.00
So. African, 52%....	24.00
So. Afr., 49-51%....	22.00
Indian, 58-50%	nominal
Indian, 48-50%	nominal

Refractories

Per 1000 f.o.b. Works

FIRE CLAY BRICK
First Quality

Pa., Ill., Ky., Md., Ga., Mo.	$45.00
Alabama	48.00

Second Quality

Pa., Ill., Ky., Md., Mo., Ga., Ala.....	40.00

Ohio

First quality	$40.00
Intermediary	36.00
Second quality	25.00

MALLEABLE BUNG BRICK	
All bases	50.00
SILICA BRICK	
Pennsylvania	$45.00
Joliet, E. Chicago....	54.00
Birmingham, Ala....	52.00
MAGNESITE	
Dead burned grain, Chester, Pa., Baltimore bases, net	40.00
Domes, Chewelah, Wash., base	22.00

BASIC BRICK
Net ton, f.o.b. Baltimore, Plymouth Meeting, Pa. Chester, Pa.

Magnesite brick	$65.00
Chrome brick	45.00
Chemically bonded magnesite	55.00

Fluorspar, 85-5

Washed gravel, duty paid, tide, net ton	$19.00
Washed gravel, f.o.b. Ill., Ky., net ton, carloads	$17.00

Ferroalloys

Dollars, except Ferrochrome

Ferromanganese, 78-82% tidewater, duty paid	85.00
del. Pittsburgh	90.24
Spiegeleisen, 19-20%, dom. fur. spot†	26.00
Ferrosilicon 50%, freight all., cl.	77.50
Do., less carload..	85.00
Do., 75 per cent..	126-130.00
Spot, $5 a ton higher.	
Silicomang., 2½ carb.	90.00
2% carbon	95.00
1% carbon	105.00
Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb. con. del.	10.00
Ferrotungsten, stand., lb. cont. del.	1.35- 1.45
Ferrovanadium, 35 to 40% lb., cont., on analysis	2.70- 2.90
Ferrotitanium, c. l., prod. plant, frt. allow., net ton	137.50
Spot, 1 ton, frt., allow., lb.	7.00
Do., under 1 ton..	7.50
Ferrophosphorus, per ton, c. l., 17-19%, Rockdale, Tenn., basis, 18%, $2 unitage	50.00
Ferrophosphorus, electrolytic, per ton c. l., 23-26% f.o.b. Anniston, Ala., 24% $2.75 unitage	65.00
Ferromolybdenum, stand. 50-60%, lb.	0.95
Molybdate, lb. cont.	0.80

†Carloads, Quan. diff. apply.

Nonferrous Mill Products

F.o.b. mill base, cents per lb. except as specified. Copper, brass products based on 8.50c Conn. copper

Sheets	
Yellow brass (high)	14.25
Copper, hot rolled..	15.50
Lead, cut, to jobbers	7.75
Zinc, 100-lb. base....	9.00
Tubes and Pipes	
High yellow brass	16.75
Seamless copper	16.75
Rods	
High yellow brass	12.75
Copper, hot rolled..	12.75
Anodes	
Copper untrimmed..	13.25
Wire	
Yellow brass (high)	14.75

Old Metals

Deal, buying prices, cents lb.

No. 1 Composition Red Brass	
New York	4.75- 5.00
Chicago	4.62½-4.87½
*Cleveland	4.75- 5.25
*St. Louis	4.75- 5.00
Heavy Copper and Wire	
New York	6.25-6.37½
Chicago, No. 1	5.87½-6.12½
*Cleveland	5.75- 6.00
*St. Louis	5.50- 5.75
Composition Brass Borings	
New York	4.50- 4.75
Light Copper	
New York	5.37½-5.62½
Chicago	4.62½-4.87½
*Cleveland	4.75- 5.25
*St. Louis	5.00- 5.25
Light Brass	
Chicago	2.62½-2.87½
*Cleveland	2.50- 2.75
Lead	
New York	3.00- 3.25
Cleveland	3.00- 3.25
*Chicago	2.75- 3.00
*St. Louis	3.25- 3.40
Zinc	
New York	2.25- 2.50
*Cleveland	2.00- 2.25
*St. Louis	2.50- 2.75
Aluminum	
Clips, soft, Clev....	13.00-13.50
Borings, Cleveland..	7.00- 7.25
Mixed, cast, Cleve....	11.00-11.25
Mixed cast, St. L.....	11.75-12.00

Secondary Metals

Brass ingot, 85-5-5-5	8.75
Remelt al. St. No. 12	15.50

Iron and Steel Scrap Prices

Corrected to Friday night. Gross tons delivered to consumers, except where otherwise stated

HEAVY MELTING STEEL	☐
Birmingham	10.00-10.50
Boston, dealers	6.00- 6.50
Buffalo, No. 1	11.00-12.00
Buffalo, No. 2	9.50-10.00
Chicago, No. 1	10.50-11.00
Cleveland, No. 1	10.00-10.50
Cleveland, No. 2	9.50-10.00
Detroit, No. 1	8.50- 9.00
Detroit, No. 2	7.50- 8.00
Eastern Pa.	10.50
Eastern Pa., No. 2	8.00- 8.50
Federal, Ill.	8.00- 8.50
Granite City, R. R.	8.50- 9.00
Granite City, No. 2	7.00- 7.50
N. Y., deal. R. R.	8.50
N. Y., deal. No. 2	7.00
Pittsburgh, No. 1	11.75-12.25
Valleys, No. 1	12.00-12.50
COMPRESSED SHEETS	☐
Buffalo, dealers	10.50-11.50
Chicago, factory	9.50-10.00
Cleveland	9.75-10.25
Detroit	8.50- 9.00
E. Pa., new mat.	9.50-10.00
Pittsburgh	11.25-11.75
St. Louis	7.50- 8.00
Valleys	11.50-12.00
BUNDLED SHEETS	☐ ☐
Buffalo	7.50- 8.00
Cincinnati, del.	7.00- 7.50
Cleveland	8.00- 8.50
Pittsburgh	10.25-10.75
St. Louis	5.00- 5.50
SHEET CLIPPINGS LOOSE	☐
Chicago	5.50- 6.00
Cincinnati	6.00- 6.50
Detroit	4.50- 5.00
St. Louis	4.50- 5.00
STEEL RAILS, SHORT	☐
Birmingham	12.00-12.50
Buffalo	13.00-13.50
Chicago (3 ft.)	12.00-12.50
Chicago (2 ft.)	12.50-13.00
Cincinnati, del.	11.50-12.00
Detroit	10.00-10.50
Pitts., open-hearth, 3 ft. and less	14.00-14.50
St. Louis, 2 ft. & less	13.00-13.50
STEEL RAILS, SCRAP	☐
Boston	6.25- 7.00
Chicago	10.50-11.00
Pittsburgh	12.25-12.75
STOVE PLATE	☐ ☐
Birmingham	7.00- 8.00
Boston, dealers	4.75- 5.00
Buffalo	9.00- 9.50
Chicago, net	7.50- 8.00
Cincinnati, dealers	6.00- 6.50
Detroit, net	6.00- 6.50
Eastern Pa.	8.50- 9.00
N. Y., deal. fdry.	6.00
St. Louis	6.50- 7.00
COUPLERS, SPRINGS	☐
Buffalo	13.00-13.50
Chicago, springs	12.00-12.50
Eastern Pa.	13.50-14.00
Pittsburgh	14.00-14.50
St. Louis	9.50-10.00

ANGLE BARS—STEEL	☐
Chicago	12.00-12.50
St. Louis	9.00- 9.50
LOW PHOSPHORUS	☐ ☐
Buffalo, billets and bloom crops	13.00-14.00
Cleveland, billet, bloom crops	13.00-13.50
Eastern Pa. crops	15.00-15.50
Pittsburgh, billet, bloom crops	14.75-15.25
Pittsburgh, sheet bar crops	13.75-14.25
FROGS, SWITCHES	☐ ☐
Chicago	10.50-11.00
St. Louis, cut	9.00- 9.50
SHOVELING STEEL	☐ ☐
Chicago	10.50-11.00
Federal, Ill.	8.00- 8.50
Granite City, Ill.	7.00- 7.50
RAILROAD WROUGHT	☐
Birmingham	6.50- 7.50
Boston, dealers	6.00- 6.50
Buffalo, No. 1	8.00- 8.50
Buffalo, No. 2	11.00-12.00
Chicago, No. 1 net	9.00- 9.50
Chicago, No. 2	10.50-11.00
Cincinnati, No. 2	8.25- 8.75
Eastern Pa.	10.50-11.00
N. Y., No. 1 deal.	7.25- 7.75
St. Louis, No. 1	5.50- 6.00
St. Louis, No. 2	8.00- 8.50
SPECIFICATION PIPE	☐
Boston	4.50- 4.75
Eastern Pa.	9.00
New York, dealers	3.50- 3.75
BUSHELING	☐ ☐
Buffalo, No. 1	10.50-11.50
Chicago, No. 1	9.50-10.00
Cinci., No. 1 deal.	6.25- 6.75
Cincinnati, No. 2	4.50- 5.00
Cleveland, No. 2	7.50- 8.00
Detroit, No. 1 new	7.50- 8.00
Valleys, new No. 1	11.50-12.00
MACHINE TURNINGS	☐
Bimingham	4.50- 5.00
Boston, dealers	2.00- 2.25
Buffalo	5.00- 5.50
Chicago	650- 7.00
Cincinnati, dealers	4.50- 5.00
Cleveland	7.50- 8.00
Detroit	5.00- 5.50
Eastern Pa.	5.50- 6.00
New York, dealers	1.50- 1.75
Pittsburgh	7.25- 7.75
St. Louis	4.00- 4.50
Valleys	8.00- 8.50
BORINGS AND TURNINGS	☐
For Blast Furnace Use	
Boston, dealers	3.25- 3.50
Buffalo	6.50- 7.00
Cincinnati, dealers	4.50- 5.00
Cleveland	7.50- 8.00
Detroit	6.00- 6.50
Eastern Pa.	6.00
New York, dealers	1.50- 1.75
Pittsburgh	8.25- 8.75
CAST IRON BORINGS	☐ ☐
Birmingham, plain	4.50- 5.00
Boston, chemical	8.50- 9.00
Boston, dealers	3.25- 3.50
Buffalo	6.50- 7.00
Chicago	6.50- 7.00
Cincinnati, dealers	4.50- 5.00
Cleveland	7.50- 8.00
Detroit	6.00- 6.50
E. Pa., chemical	12.00-15.00
New York, dealers	1.50- 1.75
Pittsburgh	8.25- 8.75
St. Louis	4.25- 4.75
PIPE AND FLUES	☐ ☐
Cincinnati, dealers	4.75- 5.25
RAILROAD GRATE BARS	☐
Buffalo	6.50- 7.00
Chicago, net	7.25- 7.75
Cincinnati	5.00- 5.50
Eastern Pa.	8.50
New York, dealers	5.00- 5.50
St. Louis	6.00- 6.50
FORGE FLASHINGS	☐ ☐
Boston, dealers	4.50- 4.75
Buffalo	11.00-11.50
Cleve., over 10 in.	9.00- 9.50
Detroit	7.00- 7.50
FORGE SCRAP	☐ ☐
Boston, dealers	4.50- 4.75
Chicago, heavy	12.00-12.50
Eastern Pa.	10.50
ARCH BARS, TRANSOMS	☐
St. Louis	11.25-11.75
AXLE TURNINGS	☐ ☐
Boston, dealers	4.50- 5.00
Buffalo	9.00- 9.50
Chicago, elec. fur.	10.25-10.75
Cleveland	8.50- 9.00
Eastern Pa.	11.00
St. Louis	7.00- 7.50
STEEL CAR AXLES	☐ ☐
Birmingham	10.50-11.50
Boston, ship, point.	9.00- 9.50
Buffalo	13.00 13.50
Chicago, net	11.75-12.25
Eastern Pa.	14.00-15.00
St. Louis	11.00-11.50
SHAFTING	☐ ☐
Boston, ship. point.	10.75-11.00
Eastern Pa.	16.00
New York, dealers	10.75-11.25
St. Louis	12.50-13.00
CAR WHEELS	☐ ☐
Birmingham, iron	8.50- 9.00
Boston, iron deal.	6.50- 6.75
Buffalo, iron	12.25-12.75
Buffalo, steel	13.00-13.50
Chicago, iron	11.50-12.00
Chicago, rolled steel	12.00-12.50
Cincinnati, iron	9.00- 9.50
Eastern Pa., iron	12.50-13.00
Eastern Pa., steel	13.50-14.00
Pittsburgh, iron	11.00-11.50
Pittsburgh, steel	14.00-14.50
St. Louis, iron	8.25- 8.75
St. Louis, steel	9.00- 9.50
NO. 1 CAST SCRAP	☐ ☐
Birmingham	9.00- 9.50
Boston, No. 2	5.50- 6.00
Boston, tex. con.	10.50-11.00
Buffalo, cupola	10.00-10.50
Buffalo, mach.	11.50-12.00
Chicago, agri. net	8.00- 8.50
Chicago, mach. net	9.00- 9.50
Chi., railroad net	8.75- 9.25
Cinci., mach. cup	9.50-10.00
Cleveland, cupola	11.75-12.25
Detroit, net	8.50- 9.00
Eastern Pa., cupola	12.00
Pittsburgh, cupola	13.00-13.50
San Francisco, del.	13.50-14.00
Seattle	7.00- 8.50
St. Louis, No. 1	8.25- 8.75
St. L., No. 1 mach.	10.00-10.50
HEAVY CAST	☐ ☐
Boston, del.	6.50- 6.75
Buffalo, break	8.50- 9.00
Cleveland, break.	8.25- 8.75
Detroit, break.	6.50- 7.00
Detroit, auto net	9.00- 9.50
Eastern Pa.	11.00
N. Y., No. 1, deal.	7.00- 7.50
N. Y., break. deal.	6.50- 7.00
Pittsburgh	10.50-11.00
MALLEABLE	☐ ☐
Boston, consum.	12.50-12.75
Buffalo	12.50-13.00
Chicago, R. R.	12.00-12.50
Cincinnati, agri. del.	8.50- 9.00
Cinci., R. R. del.	10.00-10.50
Cleveland, rail.	12.50-13.00
Detroit, auto	8.50- 9.00
St. Louis, R. R.	9.00- 9.50
Eastern Pa., R. R.	11.50-12.00
RAILS FOR ROLLING	☐
5 feet and over	
Birmingham	10.50-11.50
Boston, dealers	7.00- 7.25
Buffalo	12.00-12.50
Chicago	12.00-12.50
Eastern Pa.	12.00-13.00
New York, dealer	7.50- 8.00
St. Louis	10.00-10.50
LOCOMOTIVE TIRES	☐
Chicago (cut)	12.00-12.50
St. Louis, No. 1	9.75-10.25
LOW. PHOS. PUNCHINGS	☐
Buffalo	13.75-14.25
Chicago	12.00-12.50
Eastern Pa.	14.50-15.00
Pittsburgh	13.75-14.25

Nonferrous Metal Prices of the Week

Spot unless otherwise specified. Cents per pound

	Copper: Electro., del. Conn.	Copper: Lake, del. Midwest	Copper: Casting, refinery	Straits Tin: New York Spot	Straits Tin: New York Futures	Lead: New York N. Y.	Lead: East St. L.	Zinc: St. L.	Aluminum 98-99%	Antimony Spot, N. Y.	Ingot Nickel
May 19	8.50	8.62½	8.25	53.15	53.12½	4.00	3.85	4.35	*22.90	8.40	36.00
May 21	8.50	8.62½	8.25	53.12½	53.12½	4.00	3.85	4.35	*22.90	8.40	36.00
May 22	8.50	8.62½	8.25	53.25	53.22½	4.00	3.85	4.35	*22.90	8.40	36.00
May 23	8.50	8.62½	8.25	52.75	52.72½	4.00	3.85	4.35	*22.90	8.37½	36.00
May 24	8.50	8.62½	8.25	52.75	52.77½	4.00	3.85	4.35	*22.90	8.37½	36.00
May 25	8.50	8.62½	8.25	53.00	52.97½	4.00	3.85	4.35	*22.90	8.37½	36.00

*Nominal range 19.00c to 22.90c.

Warehouse Iron and Steel Prices

Cents per pound for delivery within metropolitan districts of cities specified

STEEL BARS	
Baltimore*	3.00c
Boston††	3.05c
Buffalo	2.95c
Chattanooga	3.41c
Chicago	3.05c
Cincinnati	3.25c
Cleveland	3.05c
Detroit	3.13½c
Houston	3.00c
Los Angeles	3.70c
New Orleans	3.40c
New York‡(d)	3.32c
Pittsburgh(h)	3.00c
Philadelphia*	3.00c
San Francisco	3.60c
Seattle	3.60c
St. Louis	3.29c
St. Paul	3.00c
Tulsa	3.25c

IRON BARS	
Portland	3.40c
Baltimore*	3.00c
Chattanooga	3.41c
Chicago	2.75c
Cincinnati	3.25c
New York‡(d)	3.32c
Philadelphia*	3.00c
St. Louis	3.29c
Tulsa	3.25c

REINFORC. BARS	
Buffalo	1.95c
Chattanooga	3.41c
Chicago	2.10c-2.60c
Cleveland (c)	1.97½c
Cincinnati	3.10c
Houston	3.25c
Los Ang., cl.	2.15c
New Orleans	3.50c
Pitts., plain(h)	3.15c
Pitts., twisted squares (h)	3.27½c
San Francisco	2.45c
Seattle	3.50c
St. Louis	3.44c
Tulsa	3.25c
Young.	2.30c-2.60c

SHAPES	
Baltimore*	3.00c
Boston††	3.22c
Buffalo	3.20c
Chattanooga	3.61c
Chicago	3.25c
Cincinnati	3.45c
Cleveland	3.36c
Detroit	3.45c
Houston	3.00c
Los Angeles	3.70c
New Orleans	3.60c
New York(d)	3.42c
Philadelphia*	3.00c
Pittsburgh(h)	3.20c
Portland	3.55c
San Francisco	3.55c
Seattle	3.55c
St. Louis	3.49c
St. Paul	3.25c
Tulsa	3.50c

PLATES	
Baltimore*	3.00c
Boston††	3.23c
Buffalo	3.20c
Chattanooga	3.61c
Chicago	3.25c
Cincinnati	3.45c
Cleveland, ¼-in. and over	3.36c
Detroit	3.30c
Detroit, ⅜-in.	3.65c
Houston	3.00c
Los Angeles	3.70c
New Orleans	3.60c
New York(d)	3.45c
Philadelphia*	3.00c
Phila. floor	5.00c
Pittsburgh(h)	3.20c
Portland	3.55c
San Francisco	3.55c
Seattle	3.55c
St. Louis	3.49c
St. Paul	3.25c
Tulsa	3.50c

NO. 10 BLUE	
Baltimore*	3.20c
Boston††	3.40c
Buffalo	3.10c
Chattanooga	3.51c
Chicago	3.20c
Cincinnati	3.35c
Cleveland	3.26c
Det., 8-10 ga.	3.28½
Houston	3.35c
Los Angeles	3.80c
New Orleans	3.70c
New York	3.42c
Portland	3.75c
Philadelphia*	3.20c
Pittsburgh(h)	3.10c
San Francisco	3.75c
Seattle	3.75c
St. Louis	3.44c
St. Paul	3.45c
Tulsa	3.70c

NO. 24 BLACK	
Baltimore*†	3.76c
Boston (g)	4.15c
Buffalo	3.25c
Chattanooga	4.41c
Chicago	4.10c
Cincinnati	4.25c
Cleveland	4.16c
Detroit	4.185c
Los Angeles	4.35c
New York	4.05c
Philadelphia*†	3.80c
Pittsburgh**	3.80c
Portland	4.40c
San Francisco	4.40c
Seattle	4.40c
St. Louis	3.94c
St. Paul	3.695c
Tulsa	4.75c

NO. 24 GAL. SHEETS	
Baltimore*†	4.36c
Buffalo	4.00c
Boston (g)	4.75c
Chattanooga	5.01c
Chicago (h)	4.70c
Cincinnati	4.85c
Cleveland	4.76c
Detroit	4.85c
Houston	4.40c
Los Angeles	5.05c
New Orleans	4.95c
New York	4.25c
Pitts.** (h)	4.30-4.60c
Portland	5.00c
San Francisco	5.00c
Seattle	5.00c
St. Louis	4.54c
St. Paul	4.19c
Tulsa	5.10c
Philadelphia*†	4.40c

BANDS	
Baltimore*	3.30c
Boston††	3.40c
Buffalo	3.30c
Chattanooga	3.76c
Chicago	3.45c
Cincinnati	3.60c
Cleveland	3.51c
Detroit, ⅜-in. and lighter	3.53½c
Houston	3.25c
Los Angeles	3.90c
New Orleans	3.95c
New York(d)	3.77c
Philadelphia	3.30c
Pittsburgh(h)	3.85c
Portland	3.90c
San Francisco	4.05c
Seattle	3.90c
St. Paul	3.20c
Tulsa	3.45c
St. Louis	3.69c

HOOPS	
Baltimore	2.80c
Boston	4.40c
Buffalo	3.55c
Chicago	3.45c
Cincinnati	3.60c
Det., No. 14 and lighter	3.53½c
New York	3.77c
Philadelphia	3.55c
Pittsburgh(h)	3.85c
Seattle	5.60c
St. Paul	3.75c

COLD FIN. STEEL	
Baltimore (c)	3.71c
Boston	4.00c-4.50c
Buffalo (h)	3.55c
Chattanooga*	4.06c
Chicago (h)	3.50c
Cincinnati	3.70c
Cleveland (h)	3.50c
Detroit	3.63½c
Los Ang.(f)(d)	5.95c
New Orleans	4.30c
New York	3.92c-4.42c
Philadelphia	3.73c
Pittsburgh(h)	3.45c
Portland (f)	4.75c
San Fran.(f)(d)	5.95c
Seattle (f)(d)	4.75c
St. Paul	3.20c
St. Louis	3.74c
Tulsa	4.65c

COLD ROLL. STRIP	
Boston, 0.100-in., 500 lb. lots	5.35c
Buffalo	5.25c
Chicago (b)	3.45c
Cincinnati	5.80c
Cleveland (b)	3.20c
Detroit	3.33c
Philadelphia	4.00c
New York	4.70c
St. Louis	5.74c

(b) Plus straightening, cutting and quantity differentials.
(c) Plus mill, size and quantity extras.
(d) Minus quant. diff.
(e) New mill classif.
(f) Rounds only.
(g) 50 bundles or over.
(h) Outside delivery, 10c less.

‡Domestic bars.
*Plus quan. extras.
**Under 25 bundles.
*†50 or more bundles.
†New extras apply.
††Base 40,000 lbs. extras on less.

Prices at Detroit, Cleveland, Chicago, Pittsburgh, Cincinnati, Chattanooga, New York, Boston, St. Louis on heavier lines are subject to new quantity differentials:

399 pounds and less, up 50 cents; 400 to 9999 pounds, base; 10,000 to 19,999 pounds, 15 cents under; 20,000 to 39,999 pounds, 25 cents under; 40,000 pounds and over, 35 cents under base.

Current Iron and Steel Prices of Europe

Dollars at Rates of Exchange, May 24

Export Prices f. o. b. Ship at Port of Dispatch—By Cable (or Radio)

	British gross tons U. K. ports £ s d		Continental Channel or North Sea ports, metric tons Gold parity, $4.8665 £ s d	
PIG IRON				
Foundry, 2.50-3.00 Silicon.	$15.30	3 0 0	$8.03	1 13 0
Basic bessemer	13.77	2 14 0*	7.30	1 10 0
Hematite, Phos. .03-.05	15.68	3 1 6	....	.....
SEMIFINISHED STEEL				
Billets	$28.05	5 10 0	$11.44	2 7 0
Wire rods, No. 5 gage	39.78	7 16 0	21.90	4 10 0
FINISHED STEEL				
Standard rails	$39.53	7 15 0	$26.77	5 10 0
Merchant bars	1.71c	7 10 0	.69c to .72c	3 2 6 to 3 5 0
Structural shapes	1.68c	7 7 6	.63c to .66c	2 17 6 to 3 0 0
Plates, †¼ in. or 5 mm.	1.82c	8 0 0	.91c	4 2 6
Sheets, black, 24 gage or 0.5 mm.	2.11c	9 5 0	1.21c to 1.24c	5 10 0 to 5 12 6
Sheets, gal., 24 gage, corr.	2.57c	11 5 0	1.43c	6 10 0
Bands and strips	1.88c	8 5 0	.88c	4 0 0
Plain wire, base	2.22c	9 15 0	1.18c	5 7 6
Galvanized wire, base	2.62c	11 10 0	1.38c to 1.40c	6 5 6 to 6 7 6
Wire nails, base	2.74c	12 0 0	1.27c	5 15 0
Tin plate, box 108 lbs.	$ 4.41	0 17 3	....	.....

British ferromanganese $85 delivered Atlantic seaboard, duty-paid. German ferromanganese £9 0s 0d 4($3.74) f.o.b.

Domestic Prices at Works or Furnace—Last Reported

	£ s d		French Francs		Belgian Francs		Reich Marks
Fdy. pig iron, Si. 2.5	$17.21	3 7 6(a)	$12.58	190	$13.84	295	$24.86	63
Basic bessemer pig iron	16.58	3 5 0(a)*	12.25	185	13.60	290	27.42	(b)69.50
Furnace coke	4.46	0 17 6	7.94	120	5.16	110	7.60	19.25
Billets	28.05	5 10 0	28.47	430	20.64	440	38.08	96.50
Standard rails	1.88c	8 5 0	2.10c	700	2.31c	1,100	2.36c	132
Merchant bars	1.96c	8 12 0	1.68c	560	1.16c	550	1.97c	110
Structural shapes	2.00c	8 15 0	1.65c	550	1.16c	550	1.92c	107.50
Plates, †¼-in. or 5 mm.	1.93c	8 10 0	2.10c	700	1.47c	700	2.27c	127
Sheets, black	2.39c	10 10 0§	2.55c	850‡	1.63c	775‡	2.58c	144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.	2.96c	13 0 0	4.50c	1,500	3.15c	1,500	6.62c	370
Plain wire	2.22c	9 15 0	3.39c	1,130	2.31c	1,100	3.10c	173
Bands and strips	2.39c	10 10 0	1.95c	650	1.47c	700	2.27c	127

*Basic. †British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic price. British quotations are for basic open-hearth steel. Continental usually for basic-bessemer steel. (a) del. Middlesbrough. (b) hematite

Bars

Bar Prices, Page 60

Pittsburgh—Orders for merchant steel bars and alloy bars show a declining trend. Although the automotive industry is chiefly responsible for this, other industries, such as the farm implement manufacturers, are specifying steadily. Shipments of hot-rolled bars to cold-drawn bar finishers are slower. The market is quoted 1.90c, base Pittsburgh, on merchant bars; and 2.55c, Pittsburgh, on alloy bars.

Cleveland—Approximately 65 per cent of steel bars made here normally are absorbed in automobile production, but for the past week the proportion of tonnage on shipping orders from these manufacturers dropped to 20 per cent of the total. An unusual development, however, was that the tonnage released by other miscellaneous manufacturing lines more than made up for the loss in the automobile classification. Included in these orders were releases from railroads, builders of road scrapers, agricultural implement makers, nut and bolt interests, and for rods from tubing manufacturers. A surplus of bars and rods is not being accumulated here against strike threats. Books are to be opened June 1 for third quarter at current prices.

Chicago—Soft steel bar specifications are moderately lighter, due in large measure to reduced requirements of the automotive industry and to a slight tapering in miscellaneous needs. The farm implement industry is curtailing operations, a seasonal trend to a certain extent. New business is light with the market continuing 1.95c for soft steel bars and 1.85c for rail steel.

Boston — Commercial steel bar specifications have declined, but another flurry of orders is expected before the end of present prices July 1.

New York—Commercial steel bar specifications have improved but unless there is a further substantial increase total releases for May will be less than for April. No change in price is expected for third quarter contracts, though new mill quantity extras probably will become effective June 1.

Philadelphia—Fair releases of steel bars are being received from manufacturers but jobbers show little disposition to stock.

Geometric Tool Co., New Haven, Conn., has appointed several agents for the sale of its threading tools, threading machines and similar products, including: Ducommun Corp., 219 Central avenue, Los Angeles, for southern California; Star Machinery Co., 1731 First avenue South, Seattle, for Washington and Oregon.

Plates

Plate Prices, Page 60

Pittsburgh — Tankmakers are building inventories slightly but failure of prospects in the river barge market to develop has been a loss to the plate market. Dravo Contracting Co., Pittsburgh, recently has been fabricating ¾-inch plates bent to form corner protection for Ohio river lock walls, this new use for plates replacing heavy steel castings. The plate market is 1.85c base, Pittsburgh.

Cleveland—Plate manufacturers have had a fairly satisfactory month, and some are preparing for larger output in June in completing second quarter contracts. Demand from oil refinery equipment manufacturers and for plates for ship work has shown some improvement recently. Most shipping orders are for carload lots, and less.

Chicago—Plate demand is fairly steady for railroad needs and for various forms of heavy construction. Tank fabrication is slow, although the outlook for better demand from the oil industry is better, with some new construction under consideration.

Boston—Plate specifications hold up well, both for railroads and tanks. Miscellaneous buying, including that by boiler shops, is more active and a small total of business has been taken at 1.95c, Coatesville, Pa.

New York—While plate specifications this month have lagged behind those of April the past week has shown a perceptible increase. The current price of 1.95c, Coatesville, or 2.13c, New York, probably will be reaffirmed for third quarter. Mill quantity extras will probably go into effect June 1.

Philadelphia—Plate sellers are awaiting specifications on plates for four cruisers, three small and one large. General specifications are better, with a further gain expected.

Contracts Placed

1250 tons, 84-inch welded pipe, Santa Maria Reservoir Co., Monte Vista, Colo., to Thompson Mfg. Co., Denver.

750 tons, two tanks for Shell Eastern Petroleum Co., Portland, Me., to Chicago Bridge & Iron Works, Chicago.

500 tons, tanks for Balboa Brewery, Los Angeles, to Southwest Welding Co., Los Angeles.

350 tons, 42 pontoons, United States engineer's office, Sacramento, Calif., allocated as follows: 175 tons to Pacific Coast Engineering Co., Oakland, Calif., and 175 tons to California Steel Products Co., San Francisco.

150 tons, discharge liner plates, Boulder dam, Boulder City, Nev., to Consolidated Steel Corp., Los Angeles.

130 tons, elevated tank, Crystal Falls, Texas, to Chicago Bridge & Iron Works, Chicago.

Unstated tonnage, 60 steel tanks, 10 x 3 feet for United States engineer, Washington, to Quaker City Iron Works, Philadelphia, at $48.50 each, delivered.

Contracts Pending

300 tons, 1,000,000-gallons standpipe, Thomasville, N. C.; bids May 25.

250 tons, mainly plates for tank, naval academy, Annapolis, Md.; alternates taken on concrete and welded and riveted steel; bids May 16, specification 7661.

150 tons, tanks, Atlantic Refining Co., Philadelphia.

Sheets

Sheet Prices, Page 60

Pittsburgh—District sheet mill operations advanced 5 points last week to between 65 and 70 per cent. Orders originate from many sources besides the automotive industry. In fact, some sheet mills not so dependent upon the latter class of consumers, have been booking orders at the heaviest rate in four to five years.

Cleveland—Following the recent sharp decline in specifications from automobile manufacturers, shipping orders from these sources have improved slightly. An important nearby lake sheet mill, the bulk of whose output goes to the automobile industry, was idle last week, after operating more than a month at capacity. This mill expects to resume on an accumulation of orders this week. Production by the Cleveland sheet mills has been fairly steady, with an increase in automobile specifications during the past few days. Demand from other consumers, notably manufacturers of household equipment, has been well sustained; barrelmakers show more activity. Books for third quarter will be opened June 1, and it is indicated that no further price changes are contemplated.

Chicago—Sheet operations are well maintained despite a further decrease in specifications. While automotive demand is holding in some directions, new business in the aggregate is lighter with further decreases in prospect over coming months. Large tonnages contracted for remain to be shipped but there are expectations of cancellation of a portion of this business. Consumption by miscellaneous users is fairly

steady. Building activity still accounts for only relatively small lots of sheets, requirements of galvanized roofing material still being dull.

Boston—Shipments show little improvement. Galvanized and special finished sheets are in fair demand.

New York—The majority of sheet producers are out of the market for tonnage for delivery on contracts this quarter. A few more days should see all of them out of the market, except for some scattered tonnages which later adjustments may enable them to handle. Recent releases have been substantial, consumers being particularly active in view of the possibility of labor trouble at the mills next month.

Philadelphia—Sheet specifications are lighter, with most sellers out of the market on many descriptions for shipment this quarter. Current prices are likely to be reaffirmed when books are opened June 1 for third quarter.

L. E. Zurbach Steel Co., Cambridge, Mass., and William A. Conway, Baltimore, are low on various items of 157 tons of galvanized and black sheets for the Norfolk, Va., navy yard; bids May 11.

Cincinnati—Curtailing of specifications for sheets by automotive interests has caused production schedules in this district to drop below 60 per cent. Shipments to other users continue steady.

St. Louis—Demand from stove, refrigerator, radio and furniture manufacturers leads in the market here, with automotive releases showing a further slowing tendency.

Railroads

Track Material Prices, Page 61

Some small lots of rails are being placed, the Nickel Plate distributing 3257 tons, of which 2739 tons is new buying and 518 tons are released on an old order. It is reported the Reading has placed 8000 tons with an eastern producer.

Rail mills are receiving specifications against contracts and are making good progress against backlogs. At Chicago rail mills are operating at about 40 per cent of capacity. New business in track accessories is light but shipments against orders are good.

American Car & Foundry Co. has started work at its shops at Huntington, W. Va., on the first of its order for freight cars for the Chesapeake & Ohio.

New York, New Haven & Hartford is reported about to place an order for a light weight streamlined train. This may be built by the Goodyear-Zeppelin Corp., Akron, O., or the Pullman-Bradley Co., Worcester, Mass.

Locomotives Placed

Chief of Engineers, Washington, gasoline drive, to Whitcomb Locomotive Co., Rochelle, Ill.

Edgewood Arsenal, Maryland, small yard locomotive to Davenport-Besler Corp., Davenport, Iowa.

Rail Orders Placed

Nickel Plate, 3257 tons rails, of which 2739 tons is new order and 518 tons release on former purchase; to several mills.

Pipe

Pipe Prices, Page 61

Pittsburgh—Effective June 1 a revised method of quoting boiler tubes will become effective, placing prices on a per foot basis, with extras also changed. Buyers of oil country goods are taking out shipments actively on second quarter obligations.

Chicago—While pending orders for cast pipe are slow to close, a fair number of new projects are appearing for bids and a large tonnage of prospective work is scheduled for early action. Chicago is expected to place 1114 tons of 12 and 16-inch pipe soon on which bids recently were opened. Frazier-Davis Construction Co., St. Louis, is low at $83,605 for general contract on a water supply pipe line from the right bank of the Missouri river to the Fort Peck dam in Montana. Project requires 15,620 feet of 6-inch cast pipe, 3½ tons of special castings, 5190 feet of 6-inch extra strong steel pipe and smaller miscellaneous lots of valves, ball joints and cast pipe.

Boston—Cast pipe prices are generally firmer in New England, but buying is largely in small lots, one of the best, 410 tons for Keene, N. H., going to the Central Foundry Co., Birmingham, Ala. The New England foundry continues to operate double turns.

New York—Inquiry for small lots of cast pipe in the New York district is fairly active, the largest tonnage being for Gloversville, N. Y., on which bids are being taken. Slightly higher prices are being received by district foundries. Emergency work calls for numerous small lots and New York city is asking bids on close to 400 tons.

Birmingham, Ala.—Intimations of an advance in the base price of cast iron pressure pipe again are heard. Production is fairly well maintained under code regulations. Awards are not numerous.

Cast Pipe Placed

765 tons, 6-inch, class 150, San Francisco, to Central Foundry Co., Birmingham, Ala.

Unstated tonnage, 1000-feet of 8-inch and 100 feet of 6-inch, New London, Wis., to United States Pipe & Foundry Co., Burlington, N. J.

Steel Pipe Placed

100 tons, 4, 6 and 8-inch, Longacres extension, Seattle, to Pacific Water Works Supply Co., Seattle.

Cast Pipe Pending

3750 tons, 12-inch, class 150, Los Angeles, specification 1438; bids opened.

1114 tons, 12 and 16-inch, Chicago; Glamorgan Pipe & Foundry Co., Lynchburg, Va., low.

300 tons, various sizes, Newman, Ill.; bids June 1.

300 tons, 2 to 10-inch, including some steel pipe, Pahokee, Fla.; also 75,000-gallon elevated water tank; bids June 19, W. P. Walker, clerk.

275 tons, 17,404 feet, 2 to 8-inch, class 150, and 2500 feet of 4-inch, Grantsville, Md.; also 50,000-gallon standpipe with alternate on 140,000-gallon size; bids May 31 to E. L. Folk, clerk.

166 tons, 14-inch, class 150, twelfth naval district, San Francisco; United States Pipe & Foundry Co., Burlington, N. J., low.

161 tons, 16-inch, class 150, Arcadia, Calif.; city already has purchased some welded steel pipe, involving 57 tons of plates.

125 tons, various sizes, Hinsdale, Ill.; bids May 29.

Unstated tonnage, 6240 feet of 6-inch, 3922 feet of 8-inch, 3005 feet of 10-inch, 9547 feet of 12-inch, 5233 feet of 18-inch, and 5563 feet of 20-inch, also 29 tons of specials, waterworks extension, Columbia, S. C.; bids May 31, W. S. Tomlinson, city engineer.

Unstated tonnage, 1535 feet of 6-inch, and 6366 feet of 4-inch, also 1760 feet of 2-inch steel pipe, $13,000 waterworks, East Bank, W. Va.; bids in, E. B. Snider, consulting engineer, Charleston, W. Va.

Steel Pipe Pending

Unstated tonnage, 3200 feet 2½-inch, zinc-coated, butt welded, threaded, quartermaster, third corps area, Baltimore; bids in.

Wire

Wire Prices, Page 61

Pittsburgh — Rate of specifying against second quarter wire contracts is slowing with the consequent result that full shipments on second quarter contracts will likely be made. Although without much test, the spot market on wire products is quoted 2.30c for plain wire and $2.60 per

keg base, Pittsburgh, for carload lots of nails.

Cleveland — Specifications show further shrinkage, due chiefly to the decline in automobile production, and considerable tonnage due for shipment on May contract quotas will be canceled. Fewer orders are being received from jobbers and the rural areas.

Chicago—Wire product specifications have declined slightly and shipments are less. Decrease in demand is fairly general, being accounted for in part by lighter requirements of the automotive industry and by slower demand for wire products in agricultural districts.

Boston—Wire specifications, with few exceptions, are slightly lower. Demand for some specialties continues brisk and rope buying remains satisfactory. Plain bright wire is 2.40c, Worcester, Mass., with little business done at that quotation.

New York—Wire tonnage is expanding, although releases have not been as large as in April. Most producers will be filled up shortly on various grades for shipment in this quarter.

Strip Steel

Strip Prices, Page 61

Pittsburgh—Strip steel demand from automotive buyers is slower, but other consumers show a steadier rate of buying, including stamping shops and farm implement makers. The market remains quoted 2.00c base, Pittsburgh, on hot-rolled strip steel and 2.80c, Pittsburgh, on cold-rolled strip.

Cleveland—Strip mills are in need of tonnage for immediate delivery, while having fairly good backlogs for production in June. Specifications from the automobile industry have improved, but the tonnage still is considerably below the level preceding the recent decline. Except for some substantial orders for cooperage stock, the market is quiet.

Chicago—Strip steel specifications and shipments are fairly heavy although some decrease is apparent from several weeks ago. Automotive needs continue to decline and consumption by miscellaneous consumers also is slightly less active. Prices are unchanged at 2.10c, Chicago, for hot strip and 2.80c, Pittsburgh-Cleveland, for cold-rolled strip.

Boston—Most strip mills, notably cold-rolled, are booked well ahead for the remainder of the quarter. Some secondary buying of hot strip has also developed.

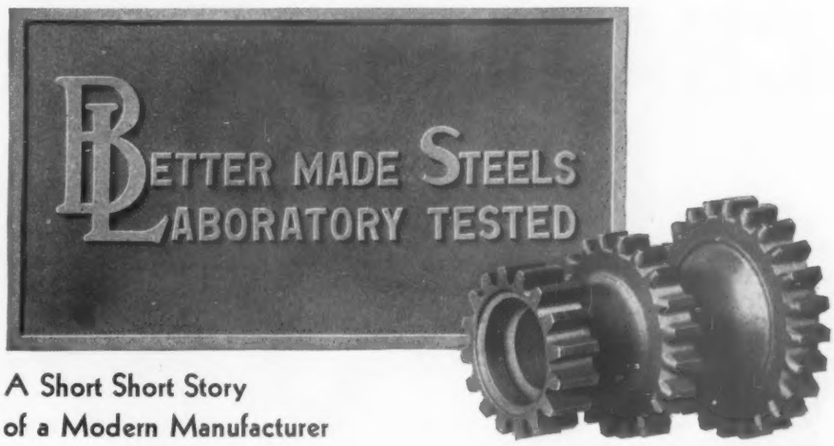
New York—Strip sellers cannot accept any more specifications for delivery this quarter. Some minor revisions in schedules may permit them to book some scattered tonnages, but these will prove the exception. Present prices of 2.00c, Pittsburgh, or 2.33c, New York, on hot strip; and 2.80c, Pittsburgh, or 3.13c, New York, for cold-rolled strip are expected to be reaffirmed for third quarter.

Philadelphia—Releases of steel strip are smaller, with current prices being extended into third quarter.

Semifinished

Semifinished Prices, Page 61

Buyers of semifinished steel, especially billets, skelp and wire rods, continue to accumulate stocks before the recent price advance becomes effective for them. Shipments of sheet bars for immediate use by tin plate producers have been increasing, but declines in this movement are looked for in June.



A Short Short Story of a Modern Manufacturer

He had been making *forged cluster gears* "the best he knew how" yet their short wear life persisted.

They were subjected to abnormally hard usage and kept "cracking up"—complaints grew, returns increased, losses threatened.

Searching for an answer, he turned to B/L service. We advised cutting the gears from *cold drawn steel* . . . and we developed a special alloy stock by repeatedly testing finished gears to destruction until a grade was found to withstand far greater punishment than actual service conditions.

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Shapes

Structural Shape Prices, Page 60

New York—While about $20,000,000 has been granted through the PWA for New York subway work, structural steel requirements will not be as heavy as expected, a large part of the fund being for completing the project. Awards are light, but approximately 2500 tons for two small buildings and a 38-foot tower in Rockefeller Center, New York, have been released.

April's structural steel volume was the best in 18 months. Final figures based on 80 per cent of the industry's capacity indicate bookings were 111 per cent over the same month last year. Tonnage available for future fabrication is 38 per cent larger than at this time last year. April bookings were approximately 96,010 tons, and shipments 65,230 tons.

Pittsburgh—Steel sheet piling has been advanced $3 a ton, effective May 25, placing the market at 2.15c, Pittsburgh; 2.25c, Chicago and Buffalo, and 2.60c, Gulf and Pacific coast ports. This reinstates the price effective just prior to a reduction two weeks ago, when a widespread coverage on "prospective" piling jobs nullified an advance. Plain structural shapes hold at 1.85c base, Pittsburgh. The market is less active owing to a decline in private jobs and in some government work. Bids on a large tonnage of structural shapes may be asked soon for a Mississippi river bridge at Baton Rouge, La., now being sponsored by joint highway bridge commissions, to be financed by the PWA. Harrington & Courtelyou, Kansas City, Mo., are reported drawing plans.

Cleveland—An award of 125 tons for a factory building for the Kleen Kut Mfg. Co., Cleveland, replacing a building recently destroyed by fire, is the first industrial job of any importance here in several months. Fabricators are bidding on 340 tons for a carferry transfer bridge at Detroit for the Pere Marquette railroad. Erie railroad bridges in western New York, requiring an aggregate of 1000 tons, still are pending. The general market continues quiet.

Boston—More small projects are active, considerable work being figured. Awards in the week in this district totaled approximately 1000 tons.

Chicago—Shape awards and inquiries continue light, with small state bridges predominating. The largest projects now pending are government dams in Washington and Oregon. The unit at Grand Coulee, Wash., on which bids go in June 15 to the department of reclamation, Spokane, will take the largest tonnage of steel piling ever required for such a project. The exact tonnage will depend on the contractor's spe-

Shape Awards Compared

	Tons
Week ended May 26	14,285
Week ended May 19	17,178
Week ended May 12	17,150
This week in 1933	18,729
Weekly average for 1933	15,413
Weekly average, 1934	17,369
Weekly average, April	12,333
Total to date, 1933	338,068
Total to date, 1934	382,123

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cifications, but it is estimated that more than 15,000 tons will be needed. In addition 7875 tons of shapes, 7150 tons of plates and 11,000 tons of concrete bars will be required.

Philadelphia—Structural tonnage still is relatively light, but the expiration of a number of 60-day protections next month should insure an increase.

Shape Contracts Placed

2500 tons, additional requirements for Rockefeller Center, New York; two six-story buildings with 38-story tower, to American Bridge Co., Pittsburgh; John Lowry, New York, general contractor.

2300 tons, tunnel ribs on specification M2025, metropolitan water district, Los Angeles, to Commercial Shearing & Stamping Co., Youngstown, O.

1100 tons, 14-story annex to Humble Oil & Refining Co.'s building, Houston, Tex., to McClintic-Marshall Corp., Bethlehem, Pa.; American Construction Co., Houston, general contractor. Project also takes 175 tons of reinforcing bars.

945 tons, grandstand, Pawtucket, R. I., to New England Structural Co., Everett, Mass.; Mark Linlenthel, general contractor.

750 tons, reinforced concrete girder viaduct for Little Rock, Ark., to Pittsburgh-Des Moines Steel Co., Pittsburgh, on bid of $93,696.

557 tons, bridge over Day river, highway No. 58, Danville, Pitt and Sylvania counties, Virginia, to McClintic-Marshall Corp., Bethlehem, Pa.; through R. W. Moore & Co., Staunton, Va.

500 tons, addition to Bullock's store, Los Angeles, to Consolidated Steel Corp., Los Angeles.

500 tons, Indiana River Refrigeration terminal, Fort Pierce, Fla., to Ingalls Iron Works Co., Birmingham, Ala.; Langston Murphy, Orlando, Fla., general contractor.

455 tons, medical school building, University of Arkansas, Fayetteville, Ark., to Arkansas Foundry Co., Little Rock, Ark.; through William Peterson, Little Rock.

395 tons, Big Horn river bridge, Wyoming, to unnamed eastern interest.

375 tons, oil derricks for steel Metal Derrick Co., Beaumont, Tex., to McClintic-Marshall Corp., Bethlehem, Pa.

300 tons, bridge at Hot Springs, S. Dak., to Pittsburgh-Des Moines Steel Co., Des Moines, Iowa.

285 tons, building for New York state hospital at Kinds Park, New York, to National Bridge Works, Long Island City, New York; through Louis Colon, general contractor. This was formerly reported as going to another fabricator.

237 tons, shapes and bars, dormitory 3, State Teachers' college, Fredericksburg, Va., to Roanoke Iron & Bridge Works, Roanoke, Va., and Truscon Steel Co., Youngstown, O.; J. F. Barbour & Sons, Roanoke, general contractors.

225 tons, state bridge, Jackson county, Missouri, to Kansas City Structural Steel Co., Kansas City, Mo.; M. E. Gillioz, Monette, Mo., general contractor.

225 tons, sanitary plant, Philadelphia, to McClintic-Marshall Corp., Bethlehem, Pa.

205 tons, Alaska bridge, Douglas, Alaska, to Pacific Car & Foundry Co., Seattle.

201 tons, state bridge in Adams county, Colorado, to unnamed interest.

200 tons, plant addition for Sylvania Corp., Fredericksburg, Va., to Belmont Iron Works, Philadelphia.

180 tons, taperd poles, Pennsylvania railroad electrification, New York-Washington, to Ingalls Iron Works Co., Birmingham, Ala.

175 tons, bridge in Calcasieu parish, Louisiana, to Virginia Bridge & Iron Co., Roanoke, Va.

150 tons, Alsea state bridge, Oregon, to Virginia Bridge & Iron Co., Roanoke, Va.; Lindstrom & Feigenson and Parker & Banfield, Portland, Oreg., general contractors.

150 tons, library at Sing Sing prison, Ossining, N. Y., to Belmont Iron Works, Philadelphia; through Silverblatt & Lasker Co.

130 tons, public school, Hanover, N. H., to Lehigh Structural Steel Co., Allentown, Pa.

125 tons, school, Shippensburg, Pa., to McClintic-Marshall Corp., Bethlehem, Pa.

125 tons, factory building for Kleen Kut Mfg. Co., Cleveland, to McClintic-Marshall Corp., Bethlehem, Pa. Small tonnage of concrete bars to Kalman

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Steel Corp., Bethlehem, Pa.

120 tons, Goodell library, Amherst, Mass., to Eastern Bridge & Construction Co., Worcester, Mass.; E. J. Pinney Co., general contractor.

110 tons, bridge, NRM 125, Las Vegas, N. M., to American Bridge Co., Pittsburgh.

110 tons, toll bridge repairs for East Liverpool, O.-Chester, W. Va., bridge, to Jones & Laughlin Steel Corp., Pittsburgh.

100 tons, shapes and bars, plant addition, Franklin Process Co., Providence, R. I., to Providence Iron & Steel Co., Providence; A. F. Smiley Construction Co., Pawtucket, R. I., general contractor.

100 tons, miscellaneous pier work, Creischerville, Staten Island, N. Y., to McClintic-Marshall Corp., Bethlehem, Pa.

Shape Contracts Pending

5000 tons, estimated, strip mill building for Ford Motor Co. at Dearborn, Mich., United Engineering & Foundry Co., Pittsburgh, drawing plans; bids expected soon.

4000 tons, plant for Semet-Solvay Co., New York, at either Baton Rouge, La., or Freeport, Tex.; bids received.

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2105 tons, Yaquina state bridge, Newport, Oreg.; General Construction Co., Seattle, and Gilpin Construction Co., Portland, Oreg., low joint bidders; Moore Dry Dock Co., San Francisco, low for shapes.

1300 tons, Illinois state highway bridges.

1000 tons, Rundel Memorial building, Rochester, N. Y.

975 tons, two state highway bridges, one at Wilmar, Minn., the other at Albert Lea, Minn., for Minnesota state highway department, St. Paul.

950 tons, piling, dock, Jacksonville, Fla.; bids May 28, to United States engineer, Jacksonville.

500 tons, train shed, Philadelphia, for Pennsylvania railroad; bids May 29.

350 tons, building for National Forge & Ordnance Co., Irvine, Pa.; preliminary figures being taken.

340 tons, carferry transfer bridge at Detroit, for Pere Marquette railroad, Detroit; bids in.

225 tons, highway bridge repairs, Parkersburg, W. Va., bridge, for West Virginia state highway department, Charlestown, W. Va.

225 tons, driveway bridge, Chrysler Corp., Detroit.

200 tons, bridge, Bellamy river, Dover, N. H., for New Hampshire Toll Bridge commission; Warren Bros. Roads Co., Cambridge, Mass., low for general contract.

150 tons, state highway bridge, Peoria, Ill.; Stobel Steel Construction Co., Chicago, low for general contract.

130 tons, administration building for Seton hospital, New York.

125 tons, state bridge, Snohomish county, Washington; T. D. MacNeill, Mt. Vernon, Wash., general contractor.

110 tons, state highway bridge, Paris, Ill.; Zimmerly Bridge Co., Paris, low for general contract.

Bolts, Nuts, Rivets

Bolt, Nut, Rivet Prices, Page 61

Small orders continue to predominate in the market for bolts, nuts and rivets, with the aggregate so far in May about equal to that of April, according to producers in the Pittsburgh district.

A general decline has appeared in specifications for bolts, nuts and rivets at Chicago. Part of the decrease is ascribed to unsettled price conditions in bolts and nuts.

Manufacturers of cap and set screws are considering new quantity differentials, and while some have filed them with the United States Cap Screw bureau, New York, so far they have not been generally adopted.

The market is unchanged at 70 off list for bolts and nuts and 3.00c, Pittsburgh, and 3.10c, Chicago, for large rivets. Effective May 21 wrought washers were advanced to 6.00 off list against a former 6.25 off. The new discount applies for basing points at Pittsburgh, Chicago and Philadelphia. Allowances of freight for lots of over 400 pounds of washers still are in effect.

Reinforcing

Reinforcing Bar Prices, Page 61

Pittsburgh—Bids went in May 25 to the Portland, Oreg., army engineers corps for 6000 tons of new billet steel bars for the Bonneville, Oreg., dam. Small reinforcing bar jobs predominate. The market is unchanged at 1.95c, Pittsburgh, for mill lengths, and at 2.05c, Pittsburgh, for cut lengths of new billet steel bars.

Cleveland—Bids are being taken by Columbus, O., May 28, on 3000 tons of reinforcing bars for a municipal sewer project. Other public and private work in this state is light. One leading seller here covering a wide area in northern Ohio was enabled to book 300 tons last week in small lots.

Chicago—Shipments of reinforcing bars against old orders are increasing slowly, but new business continues light. Few inquiries are appearing except for highway construction, with private construction activity still confined to small individual lots.

Boston — Several hundred tons have been placed for highways in Massachusetts. Billet steel bars, cut lengths, are firm at 2.05c, Pittsburgh, car lots.

New York—Reinforcing bar inquiry is slightly heavier, due in part to a larger number of small jobs. New Jersey highway department is asking bids June 4 on several projects.

New York—Featuring reinforcing bar awards in this district are two jobs totaling 1450 tons. Little is pending aside from 415 tons for the speed-line over the Delaware river bridge at Camden, N. J.

Reinforcing Steel Awards

1200 tons, head house, Maiden creek water development, Reading, Pa., to Kalman Steel Corp., Bethlehem, Pa.; through William F. Steele & Sons Co., Philadelphia, contractor.

455 tons, third unit, Homer G. Phillips Hospital for Colored, St. Louis, to Joseph T. Ryerson & Son Inc., Chicago; H. B. Deal & Co. Inc., St. Louis, general contractor. Project also takes 46 tons of shapes.

300 tons, Indiana State Teachers' college, Terre Haute, Ind., to Hugh J. Baker Co., Indianapolis; through G. W. North Construction Co.

250 tons, bridge, Ouachita river bridge and approaches, Caldwell parish, Louisiana, to Laclede Steel Co., St. Louis; List & Weatherly Construction Co., Kansas City, Mo., general contractor.

250 tons, state bridge, Monroe county, Pennsylvania, to Kalman Steel Corp., Bethlehem, Pa.; through Carl Camp, Philadelphia.

200 tons, administration building, University of Tennessee, Knoxville, Tenn., to Ingalls Iron Works Co., Birmingham, Ala.; N. E. Yearwood, Nashville, Tenn., general contractor.

199 tons, specification 23119-A, Boulder dam, Boulder City, Nev., to unnamed interest.

163 tons, state highway structure Jackson county, Missouri, to Carter Waters Corp., Kansas City; M. E. Gillioz; Monette, Mo., general contractor.

140 tons, Yonkers avenue grade separation, Saw Mill river parkway, West-

Concrete Awards Compared

	Tons
Week ended May 26	3,257
Week ended May 19	7,291
Week ended May 12	3,318
This week in 1933	833
Weekly average for 1933	3,771
Weekly average, 1934	4,893
Weekly average, April	5,214
Total to date, 1933	67,779
Total to date, 1934	107,616

chester county, New York, to Concrete Steel Co., New York; through George H. Flinn Corp.

100 tons, bridge over Day river, highway No. 58, Danville, Pitt, Sylvania counties, Virginia, to Taylor-Davis Inc., Philadelphia; through R. M. Moore & Co., Staunton, Va.

100 tons, or more, administration building, University of Tennessee, to Wilson-Weesner, Wilkinson Co., Knoxville, Tenn.; N. E. Yearwood, Nashville, Tenn., general contractor.

Reinforcing Steel Pending

3000 tons, municipal sewer system, Columbus, O.; bids May 28.

1125 tons, Yaquina state bridge, Newport, Oreg.; General Construction Co., Seattle, and Gilpin Construction Co., Portland, Oreg., low.

500 tons, sewer projects, Westchester county, New York; bids in on one section, and close June 8 on two more.

250 tons, state highways in Connecticut; specifications out.

200 tons, bridge, Bellamy river, Dover, N. H., for New Hampshire Bridge commission; Warren Bros. Roads Co., Cambridge, Mass., low for general contract.

106 tons, three New Jersey state highway projects; bids June 4 at Trenton, N. J.

100 tons, bridge for Alaska road commission; bids at Juneau, Alaska, June 18.

100 tons, New York Central railroad viaduct at Weehawken, N. J.; bids in.

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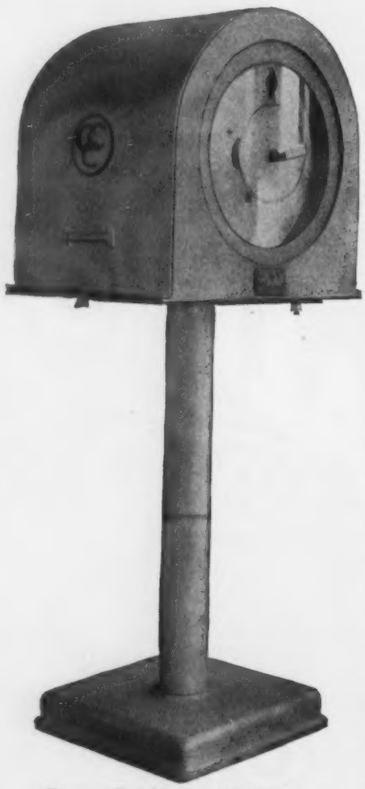

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During next pass pointer moves from previous position to new position again indicating length of sheet after the latest pass. This operation is repeated until required length of sheet is obtained. The next piece as delivered from furnace automatically resets the pointer to indicate lengths, making it possible for the operator to know definitely the length of the sheet after each pass.

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Pig Iron

Pig Iron Prices, Page 62

Pittsburgh—On June 1 or after, third quarter pig iron prices will be announced but no change is expected from the present nominal level of $18.50 for foundry irons, $19 for bessemer and $18 on basic, all Neville Island base prices. These levels have not been tested because all important consumers were under contract before the April 18 advance. Both active merchant furnaces here, Davison Coke & Iron Co.'s Neville Island, Pa., stack and Shenango Furnace Co.'s Sharpsville, Pa., furnace, are continuing in blast with backlogs being diminished rapidly.

Cleveland—Pig iron producers here will open books for third quarter June 1 at current prices, namely, $18.50 per ton for No. 2 foundry and malleable, $18 for basic, and $19 for bessemer, base, Cleveland, Toledo, O., and Detroit. These include the $1 a ton advance announced last month for tonnage not previously placed under contract for second quarter. There have been few sales at these prices, and producers will not benefit from them until third quarter. May shipments by furnace interests here are approximately one-third larger than the April tonnage. Firm contracts for June indicate that month will surpass May.

Chicago—Pending filing of new prices, the current market of $18.50, furnace, for No. 2 foundry and malleable will prevail June 1, when third quarter books may be opened. New business recently has been light and in view of heavy shipments remaining to be made before July 1 against old contracts, consumers are expected to be slow in making new commitments. Deliveries recently have been about 15 to 20 per cent heavier than during the corresponding April period, with a further increase indicated for next month. While operations of some automotive foundries are declining, schedules of jobbing plants and miscellaneous foundries are fairly steady. Schedules of farm implement manufacturers are tending downward.

Boston — Shipments have been light, generally one or two carloads at a time. Thus far consumers have not specified heavily against contracts, indicating that early next quarter volume will be better than

seasonal, unless specifications pick up materially in June.

New York—Shipments against contracts have expanded considerably. Producers generally, however, look for still heavier deliveries in June. Until recently, releases this quarter have been coming out slowly. With virtually all consumers under contract new buying so far has been negligible. Contracting for third quarter will start next month, probably at current prices.

Philadelphia—Specifications are heavier, with shipments in June expected to be the best for any month so far this year. No revision in third quarter prices are anticipated when books are opened June 1.

Buffalo—Shipments from furnaces in this district probably will show a gain of 25 per cent in May over the April total, the latter having been high for the year. June movement may even exceed May. Six furnaces continue in blast, and most consumers are covered well into the summer.

Cincinnati — Shipments continue above the April level, with prospects for a further upturn next month, if all iron under contract is to be taken out. Melt has slowed, principally through slackening in automotive demand.

St. Louis—Shipments so far this month are considerably ahead of the comparable period in April, and enough more is on books to assure a heavy movement through June. The melt is holding up well, notably at specialty plants and jobbing foundries.

Birmingham, Ala.—Consumers of pig iron are buying steadily but in limited amounts. Labor troubles at ore mines have not disturbed production, two furnaces of Republic Steel Corp. being kept in steady operation.

Toronto, Ont.—Demand is fairly well sustained, but melters are showing interest only insofar as immediate needs are concerned. Foundries on automotive work in a number of instances are operating at capacity. Daily output of pig iron is about 1000 tons.

Scrap

Scrap Prices, Page 63

Pittsburgh—The scrap market has declined 75 cents a ton to $11.75 to $12.25 for No. 1 heavy melting steel although this was not based on any sizable sales. Small distress tonnages of heavy melting steel were sold in this district last week as low as $11 and machine shop turnings dropped $1 a ton on a small sale at $7.50, delivered. An order for heavy breakable cast was placed last week by a district mill, which is reported to have paid $11 for a tonnage, although dealers are now offering only $10 for shipment to this point.

Cleveland—Steel and iron scrap is dull and trading is at a low point. Melters are keeping stocks relatively low but shipments on contract as a rule are not limited. Prices are weak and nominal.

Chicago—Scrap demand is dull with prices easy but generally unchanged. While leading mills remain out of the market, some expectations of renewed buying still are held, in view of well sustained consumption. Heavy melting steel is nominal at $10.50 to $11.

Boston—Buying of scrap is light with further indications of soft prices. Heavy melting steel is off 25 cents a ton while shafting is 25 cents a ton lower and machine shop turnings nearly $1 a ton lower.

New York—Lower prices are noted on many grades of iron and

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steel scrap, with dull trading in the domestic market. Export business, while less active, recently included 7000 tons of stove plate and cast grades. Heavy melting steel for barge loading is unchanged, but cast grades are weaker.

Philadelphia—Prices of steel and iron scrap continue their downward course on dull trading and lack of prospective buying. No. 1 heavy melting steel is nominally $10.50, although small lots have been picked up at $10.25. Lower prices are quoted on a number of grades.

Buffalo—A sharp downward turn has been taken by scrap although it is admitted there is only a nominal basis for the revision as no tonnage of consequence has been sold.

Cincinnati—Despite several cuts in iron and steel scrap quotations, prices still are weak and lower in some grades. Heavy offerings have aggravated the weakness.

Detroit—The sharpest decline this year in prices of scrap took place last week. No. 1 heavy melting steel, hydraulic compressed sheets and machine shop turnings are off 50 cents; blast furnace scrap, loose clippings, automobile malleable and shoveling turnings declined 75 cents per ton; scrap rails and No. 1 machinery cast are quoted $1 lower.

St. Louis—Lack of interest by consumers and a further expansion in supplies have resulted in further declines in iron and steel scrap prices. Activity among dealers also has subsided.

Birmingham—Selling of steel and iron scrap is slow, No. 2 heavy melting steel being more active than No. 1. No. 1 cast scrap is in fairly good demand.

Toronto, Ont.—Trading in iron and steel scrap shows no change. Demand is specialized, with foundries the most active buyers. Dealers continue to report scarcity of most active grades, but steel scrap is heavily stocked. Prices are steady.

Warehouse

Warehouse Prices, Page 64

Pittsburgh—Warehouse shipments are comparable to a month ago but May is the first month that has failed to show improvement over the month preceding.

Cleveland—Warehouse orders, in number, this month show little change from those received in April, but tonnage booked by some important interests is considerably less. Widespread labor difficulties are reported to be the principal factor restraining business.

Chicago—Sales are benefitted by better demand from miscellaneous sources, which is holding the May volume close to the April rate. Sheets are the most active product. Prices are unchanged.

New York—Warehouse sales volume is holding its rate, due to numerous small orders widely diversified, although small shipyards are leading buyers with several jobbers.

Philadelphia—Jobbers of steel products expect improvement in May in tonnage as well as income, due to higher prices. One leader expects a 10 to 15 per cent gain in tonnage over April.

Detroit—Steel warehouses are receiving a large number of orders but for small lots and shipments are less.

Cincinnati—The volume of steel from warehouse declined late in May, some of the loss being seasonal and some traced to labor troubles with a sheet fabricator. Cold-rolled strip is now quoted at 3.40c base, subject to quantity differentials.

St. Louis—While business of iron and steel warehouses has developed some irregularity average volume is about equal to the opening week of the month.

Metallurgical Coke

Coke Prices, Page 61

Small foundries, which as a class are active, continue to provide beehive coke its most active outlet. Melters are buying mainly the common brands, the market on which is $4.60 Connellsville ovens, and are taking relatively less of the premium brands, which are unchanged at $5.35, same basis. Furnace coke at $3.85 for spot shipment and 25 cents per ton less for yearly contracts, is relatively quiet. By-product coke, however, is cutting heavily into beehive, owing to cost disparities.

Shipments of by-product foundry coke at Chicago so far this month are practically equal to those of April, indicating fairly steady foundry operations. The market is expected to be continued at May levels of $8.50, ovens, for outside delivery and $.925, delivered Chicago.

Specifications for by-product foundry coke at Cincinnati are tapering. At St. Louis shipments of this grade

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are well sustained. At Birmingham, Ala., production and shipments are steady.

Nonferrous Metals

Nonferrous Metal Prices, Page 62, 63

New York—Demand for lead was fairly active last week but other nonferrous metals moved in small volume. Price easiness was noted in several directions.

Copper—Ban on the sale of non-blue eagle copper has been extended to June 15. Announcement of rules and regulations regarding blue eagle copper was made by the code authority which definitely bring all purchasers or consumers of copper into the blue eagle fold providing they adhere to the code and co-operate with the code authority in the execution of its provisions. Blue eagle copper held firm at 8.50c, Connecticut, for electrolytic. Metal for delivery abroad was easier, however. Scrap was easy and demand for brass ingots slow.

Lead—Sales for May are running ahead of April. Consumers have been active in covering for June requirements following the recent cut of $5 a ton. Stocks increased 1427 tons in April, the eighth monthly rise. The code for the industry has been signed and goes into effect June 4.

Zinc—Reports of shading unsettled the market with sales restricted to scattered carlots for prompt delivery. Ore prices in the Tri-State district were easy.

Tin—Straits tin was weak and lower last week, selling at below the 53-cent mark. Weakness in sterling exchange and fluctuations in the London market made prices here uncertain. Little business was done.

Antimony—Demand was limited in an easy market.

Aluminum—Seasonal tapering in activity was reported. Prices held.

Silver—Prices tended lower with the price for Friday 44.75c an ounce. The administration presented its silver legislation to congress providing for a 25-75 ratio with gold and a tax of 50 per cent on speculative metal now held.

Iron Ore

Iron Ore Prices, Page 62

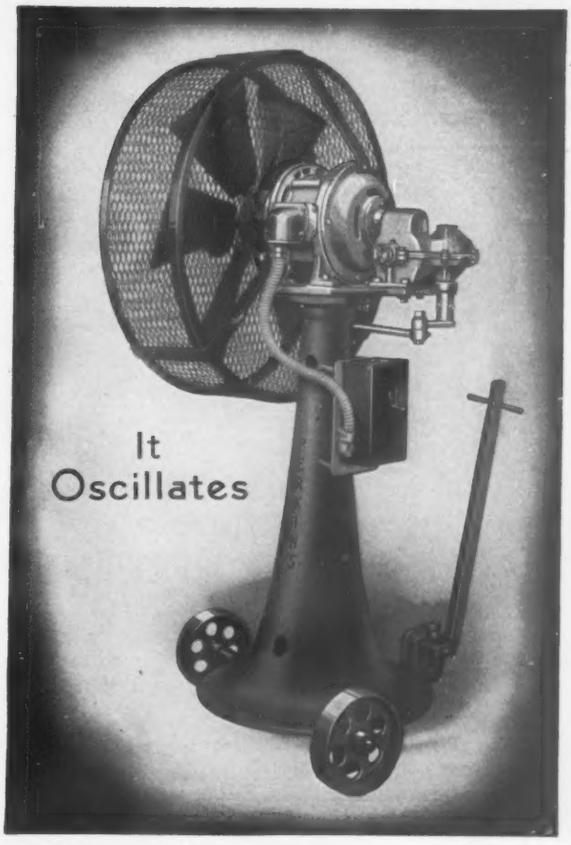
Cleveland—Following several substantial sales of Lake Superior iron ore in the open market at the 1933 level of prices, as reported last week in STEEL, the prices have been made the bases of values in the long-term contracts between producers and consumers. While lake vessel rates on iron ore have not been established definitely for the season, carriers are going along at last year's rates, and at present there is no indication of a change. The improved demand this season is indicated by the fact that 139 vessels out of the fleet of 328 were in commission May 15, compared with 20 on the same date last year.

Ferroalloys

Ferroalloy Prices, Page 62

Ferromanganese is again moving more freely, with a further increase expected in June, barring serious labor difficulties at consuming plants. Prices continue at $85, duty paid, eastern seaboard, with the question of

PERKINS MAN COOLERS



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Engineers and Manufacturers

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change not likely to come up until the latter part of June. The current price has prevailed throughout the year so far. Domestic spiegeleisen, 19 to 21 per cent, holds at $26, furnace for spot tonnages.

Tin Plate

Tin Plate Prices, Page 60

Pittsburgh—Another 5-point gain in tin plate operations in the Pittsburgh district last week brought the average back to 80 per cent. Many interests believe the rebound is temporary, in view of the fact that tin plate specifications from canmakers recently have shown a steady downward trend. All base prices on tin mill products are unchanged, with $5.25, Pittsburgh, quoted on tin plate; 2.85c on tin mill black; and 3.65c on long ternes.

Cold Finished

Cold Finished Prices, Page 61

Pittsburgh — An unsteady trend still is noticeable in demand for cold-finished steel bars. Specifications from farm implement makers, jobbers and miscellaneous users have not been sufficient to take up the slack due to the reduction in buying by automobile manufacturers. The market is steady at 2.10c base, Pittsburgh. Cold-drawn alloy bars are quoted 3.05c base, Pittsburgh.

Coke By-Products

Coke By-Product Prices, Page 61

New York—Distillates continue active, notably toluol. Specifications for naphthalene shipments are coming out freely. A change is expected in sulphate of ammonia prices after June 30.

Steel in Europe

Foreign Steel Prices, Page 64

London—(*By Radio*)—British iron and steel import duties have been officially extended without time limit, following adoption of the plan for rationalizing the industry. Producers in all districts are well booked and prices are firm. Pig iron stocks are low. Business in structural engineering is broadening. Demand for tubes is active. Australia, South American and the Continent are buying tin plate in larger volume.

Reports from the Continent state export trade is expanding, especially to Egypt, Japan and the Argentine. Great Britain is buying wire rods in the Continental market.

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Pacific Coast

Pacific Coast Prices, Page 61, 62, 64

San Francisco—(*By Air Mail*)—Movement of steel continues uninterrupted. Bids have been opened on 2210 tons of reinforcing bars and 223 tons of shapes for the Broadway tunnel at Oakland, Calif. Unnamed interests took 199 tons for the Boulder dam, Boulder City, Nev. Bids have been opened on 398 tons for two bridges on Gaffey street, Los Angeles. Pending business exceeds 26,500 tons.

Thompson Mfg. Co., Denver, booked 1250 tons of plates for an 84-inch pipe line for the Santa Maria Reservoir Co., Monte Vista, Colo. Southwest Welding Co., Los Angeles, took 500 tons of plates for tanks for the Balboa brewery and the United States engineers office, Sacramento, Calif., placed 175 tons each, for pontoons with the Pacific Coast Engineering Co., Oakland, Calif., and the California Steel Products Co., San Francisco. Consolidated Steel Corp., Los Angeles, secured 150 tons for discharge liners for Boulder dam, Boulder City, Nev. Bids have been opened on 1500 tons for a 20 to 30-inch pipe line for Oakland, Calif.

Commercial Shearing & Stamping Co., Los Angeles, took 2300 tons of tunnel ribs for the metropolitan water district, Los Angeles, and Consolidated Steel Corp., Los Angeles, booked 500 tons for an addition to Bullock's, Los Angeles.

The Los Angeles Harbor commission will call for bids soon for a municipal terminal railroad involving 56 tons of 90-pound T-rails and 128-pound girder rails.

The only cast iron pipe award of size went to Central Foundry Co., 765 tons of 6-inch pipe for San Francisco. Los Angeles has opened bids on 3750 tons of 12-inch pipe.

Third Coast Bridge Let

Seattle—Award of the general contract for the Yaquina bridge, third of five coast spans, at Newport, Oreg., has been made by the

Oregon highway commission to Seattle Construction Co., Seattle, and Gilpin Construction Co., Portland, Oreg., on a joint bid of $1,357,587. Figures for the steel span only were: Moore Dry Dock Co., San Francisco, $454,255; McClintic-Marshall Corp., Bethlehem, Pa., $457,107; Poole & McGonigle, Portland, $464,712; Columbia Steel Co., San Francisco, $516,421. Award awaits PWA approval. This project involves 2105 tons of shapes and 1125 tons of reinforcing steel.

Coluccio & Co., Seattle, bidding $232,425, were low for the railroad extension from the Northern Pacific railroad, at Adair, Wash., to the Coulee dam, 34½ miles.

Structural awards featured the market, the largest order, 805 tons, going to the Pacific Car & Foundry Co., Seattle, for the bureau of roads' bridge at Juneau, Alaska. Unnamed eastern interests are reported to have taken 395 tons for the Big Horn river bridge, Worland, Wyo. Virginia Bridge & Iron Co., Roanoke, Va., is reported to have the award for 150 tons of shapes for the Alsea, Oreg., span.

Seattle has awarded to the Pacific Water Works Supply Co., Seattle, an order for 100 tons of 4, 6 and 8-inch steel water pipe for the Longacres extension. Domestic materials are specified. Drain, Oreg., has called new bids June 4 for 3000 feet of 6 and 8-inch cast iron pipe, about 100 tons, alternate for wood; plans by Stevens & Koon, Portland.

Scrap markets are quieter. Exporters are seeking attractive purchases and price levels remain unchanged.

New Prices Filed With Institute

LOWEST base prices for the products mentioned, and effective dates, filed with the American Iron and Steel institute, New York, last week include:

Effective May 28

Rail steel merchant bars, 1.68c, Chicago. New billet steel merchant bars, 2.30c, Gulf ports.

Effective May 29

Stainless steel, type No. 302, hot-rolled strip, 24¾c; type No. 304, hot-rolled strip, 22¾c, cold-rolled strip, 29c, slabs, 16c; type No. 305, hot-rolled strip, 22¾c, cold-rolled strip, 29c, slabs, 16c; type No. 306, hot-rolled strip, 24¾c, cold-rolled strip, 31c, slabs, 17c; type No. 307, bars, 25c, hot-rolled strip, 24¾c, cold-rolled strip, 31c, slabs, 17c; type No. 308, hot-rolled strip, 26¾c, cold-rolled strip, 33c, slabs, 18c; type No. 416, hot-rolled strip, 15¾c, cold-rolled strip, 20½c, slabs, 10¾c, all at Pittsburgh.

Cold-rolled steel sheets, No. 10 gage, 3.25c; No. 20 gage, 3.70c, at Pacific coast ports.

Electrical sheets, dynamo special (disposal grade), 4.84c, Gary, Ind.

Electrical sheets, motor special (disposal grade), 4.34c, Gary, Ind.

Effective June 1

Tool steel, class 1, bars, 55c at Syracuse, N. Y., and Bethlehem, Pa.; billets, 49½c, Syracuse, N. Y.

Tool steel, class 1A, bars, 65c; billets, 58½c, both at Pittsburgh and Syracuse, N. Y.

Tool steel, class 1E, bars, 55c; billets, 49½c, Pittsburgh.

Tool steel, class 2, bars, 47c at Pittsburgh and Bethlehem, Pa.; billets, 42.3c, Pittsburgh.

Tool steel, class 2A, bars, 42c at Pittsburgh and Bethlehem, Pa.; billets, 37.8c, Pittsburgh.

Hollow drill tool steel, bars, 10c, Syracuse, N. Y., and Bethlehem, Pa.

Iron and steel enameling sheets, No. 10 gage, 3.35c; No. 20 gage, 3.80c, Pacific coast ports.

Cold-finished alloy bars, 3.05c, Buffalo, Chicago and Cleveland.

Wrought iron plates, 3/16-inch and thicker, 3c, Pittsburgh.

Quicksilver

New York—Quicksilver prices are unchanged in a dull market. Small lots are $75.50, a virgin flask of 76 pounds and round lots $75.

Windows of Washington

(*Continued from Page 17*)

ciple has been revived as a rider to a bill reported out in the house. The bill for making loans to industry—a measure which is regarded in some conservative quarters as tending to further advance the nationalization of wealth—appears slated for favorable action.

About 11,800 tons of steel will be required for the hulls of 20 new vessels which the navy has moved to build as soon as it receives an allotment of $40,000,000 from the $1,322,000,000 which the President recently requested of congress.

Included are 12 1500-ton destroyers, two 1850-ton destroyers and six 1300-ton submarines. In addition, three light cruisers and one heavy cruiser, slated for the fiscal

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year ending in 1935, are expected to be provided for soon.

To the three dams which the bureau of reclamation now has under construction will be added immediately 13 others. Bids on the labor contracts will be advertised within the next 90 days and will be awarded with all due despatch. After that the bureau, from its Denver office, will buy from time to time the vast amount of steel and equipment needed. The program of construction will stretch out over the next four to five years.

The three dams under construction are the Boulder dam, the Agency Valley dam on the Vale project in Oregon and the Hyrum dam near Logan, Utah. Next to be advertised is the Grand Coulee dam, to be located 20 miles north of Almira, Wash. Next is to be the Parker dam, on the Colorado river, near Parker, Ariz. Then will come the Alcova dam on the North Platte river near Casper, Wyoming.

Heavy Steel Tonnages

Bids on the labor contract for the Grand Coulee dam will be opened at Spokane on June 18. The requirements of this huge project are listed in the bureau's Specification No. 570 as follows:

12,500 tons concrete reinforcing bars; 6,232,000 pounds of high-pressure, hydraulically-operated gates and metal conduit linings; 45,000 pounds of control apparatus for the high-pressure gates; 1,000,000 pounds of penstock and draft tube bulkheads to be fabricated of structural steel and assembled in the field by riveting and welding; 8,710,000 pounds of 18-foot diameter power penstocks of welded steel plate construction; 2,522,000 pounds of butterfly valves and operating mechanisms, three to be 21½ feet in diameter and two 60-inch; 2,300,000 pounds of traveling and gantry cranes, including two 375-ton traveling and two 150-ton gantry cranes; 203,000 pounds of track rails; 4,242,000 pounds of trash-rack metal work; 1,600,000 pounds of structural steel for the power house; 1,200,000 pounds of metal tubing, steel and cast iron pipe, fittings and valves; 7400 pounds of aluminum curbs and handrailings; 52,000 pounds of metal stairways; 182,000 pounds of metal floor plates and gratings; 15,000 pounds of drainage pump and fittings; 1670 square feet of metal rolling doors; 2100 square feet of metal swinging doors; 3600 square feet of metal sash windows and operating device; 5000 pounds of sheet metal work; 400 square feet of metal partitions; 100,000 pounds of miscellaneous metal work; 144,000 lineal feet of electrical metal conduit; 50,000 pounds of ground wires and ground rods; 100,000 lineal feet of electrical cable.

Specification No. 552, covering the Hyrum dam, Cache valley division, Salt Lake Basin project, Utah, set forth the following requirements:

400,000 pounds of steel reinforcing bars; 52,800 pounds of steel tunnel liner plates; 65,000 pounds of high-pressure, hydraulically-operated gates and metal conduit linings; 80,000 pounds of outlet pipes; 22,000 pounds of metal walkways and stairways; 15,000 pounds of trash-rack metal work; also miscellaneous cast iron pipe and corrugated metal pipe.

Summary of Vale Project

Specification No. 560 sets forth the requirements of the Agency Valley dam, on the Vale project in Oregon, as follows:

385,000 pounds of concrete steel reinforcing bars; 22,000 pounds of trash-rack metal work; 52,200 pounds of high-pressure, hydraulically-operated gates and conduit lining; 57,700 pounds of outlet pipes; 10,300 pounds of metal walkway and stairways; 53,500 pounds of balanced needle valves; 98,000 pounds of radial gates and operating mechanisms; 9370 pounds of standard pipe, fittings and valves; 200 lineal feet of 6-inch cast iron pipe drains.

As to Boulder dam requirements, the only important steel requirements now pending is 5500 tons of concrete reinforcing bars, which are expected to be awarded shortly. No further important requirements for Boulder are to be advertised in the near future but a huge amount of equipment and material remains to be purchased for this dam. Incidentally, the labor job on the dam will not be completed until three years from now.

Now Is Time To Remove Barriers—Chas. M. Schwab

(*Continued from Page* 12)

try but generally, and has a far-reaching effect in advantage to the general public welfare.

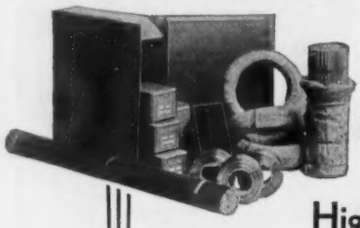
The steel industry has been a leader in passing on its savings to the public. From 1923 there was a steady decline in steel prices. I regret to say that we have been penalized by some economists for not waiting until after 1929 to reduce prices. There have been a number of misinformed persons who took 1929, when steel prices were already down, and from that alleged that our decline in prices was far short of other commodities. The current level of prices is still 21 per cent below the 1923 level, and even the somewhat firmer rates of the past few months have not yet been sufficient to put the steel industry on a profitable basis.

Wages Depend on Profits

Our present recovery has differed from the recovery after all previous crises in the fact that labor has been given the first benefits. Through voluntary action by management, wage rates in the steel industry are now 6 to 7 per cent above the 1929 peak. I am glad that this is so.

Recognizing the dual responsibility of management, it is well at this point to emphasize that the splendid idea of maintaining the purchasing power of employes can be continued only if industries are permitted and able to operate profitably. The money for high wages cannot be taken indefinitely out of surplus, or out of the stockholders' pocket.

If there are unwarranted attempts to batter down prices, to prevent the raising of capital for business development and to cripple free progress of industry, wages will fall along with the rest of our structure. We will then be back where we were a



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year ago and this we do not want to see.

Another great step forward for the mass of employes during the past years has been the wide spread of plans of employes' representation. Tried out by various steel companies for over 15 years, this principle of collective bargaining has met with general acceptance. Employes' representation recognizes that labor disputes can best be settled at their point of origin. Practical men know that the healthiest kind of relationships are developed directly between interested individuals. Irritations an differences are eliminated immediately, in mutual conference without the interference of outside agencies.

Equally important with the other accomplishments of the year is the action which the institute has taken with respect to its relations with the public. We now have in this association a central point where facts are gathered with respect to all the different aspects of our business.

Stockholders Patient

The 500,000 stockholders in our steel companies have been extremely patient over the past four years, in face of the attempts by many theorists to abolish the profit system. These investments in stock by persons in all walks of life, represent savings, sacrifices, the wages for hours of labor put away against a rainy day. These people are entitled to a return on their investment, and no governmental policy can endure which would pauperize any section of our population.

You all know that I am a believer in co-operating with President Roosevelt in his efforts toward recovery. A President must represent to the best of his ability all of the elements of a nation—the employe, the farmer, the professional groups and business. All of their interests are mutually intertwined and interdependent. I do not believe that the President is for long going to permit too drastic legislation or the plans and proposals of any group of theorists to stifle business, or set up a dictatorship of any special class.

Confidence Needed

Now is the time to remove all barriers to natural and normal employment and to this end certain legislation should be modified. The demand for steel is dependent upon the free flow of credit for manufacturing and capital goods industries. Right today there are thousands of improvements and projects held up because of the strictures of the securities act. The banking credit situation has been much liberalized, but this is helpless to do the job unless there is an adequate opportunity for the financing and refinancing of securities. The trouble with the securities act is that many of its provisions are so strict that the average business man could not undertake to promise to follow out all the requirements. Any legislation regulating the sale of securities should be drawn along lines contemplating free business activity as operated by honest men. The criminal law should take care of catching the dishonest.

The anxiety which business feels toward pending legislation is very real. It arises from what business men have experienced in the past. It is inconceivable to me, however, that this condition will long be permitted to continue. The pump has been primed, the necessary stimulus to recovery has been applied, the nation is on its way to prosperity, and what we need now is a sure background for confidence and a real assurance that the period of experimentation is behind us.

Enters New Era of Service

In this past year the American Iron and Steel institute has entered a new era of service. Skeptics have wondered whether business was capable of self-government. The strides forward which have been made are without parallel in our industrial history. Give our business men the opportunity to do those things which they believe ought to be done and they will come through every time.

Died:

(*Concluded from Page* 20)

Reading, being named vice president and sales manager of the Reading Steel Casting Co. More recently he became a co-owner of the Empire Steel Casting Co. in Reading. He maintained an active interest in sports and politics.

□ □ □

William C. Cronemeyer, 86, veteran tin plate producer and known as "the father of the tin plate industry," at a hospital in McKeesport, Pa., May 22. Born in Germany in 1847, he came to the United States in 1869 and organized the United States Iron & Tin Plate Co., serving as president, general manager and secretary until the company was absorbed by the American Tin Plate Co. He retired about 20 years ago.

□ □ □

Joseph F. Mock, 88, until two years ago superintendent of bridges for the Keystone Bridge Co. and the Ohio River Railway Co., in Loretto, Pa., May 19, at the home of Charles M. Schwab, his brother-in-law.

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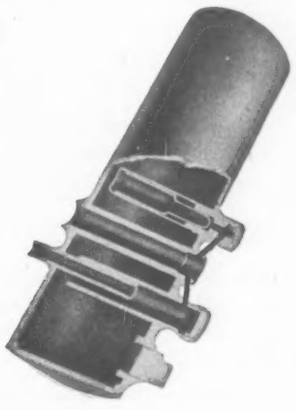

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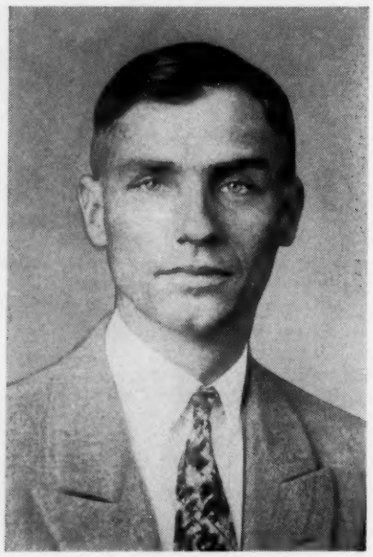
How Steel Code Is Operating

BY WALTER S. TOWER

THE code of fair competition of the iron steel industry, commonly called the steel code, is nearing the end of its trial period, which by Presidential action last November was extended to May 31, 1934. In general, it seems fair to state that both the national recovery administration and the members of the steel code have felt that the code has helped substantially in the national recovery program, and that, with some modifications which the board of directors consider desirable, it should be continued after May 31.

The board of directors of the institute is the administrative body for the steel code, and the 30 members of the board have been chosen from the various interests of the industry. In order to facilitate its work the board has found it necessary to establish seven committees to help in the administration of the code. Those committees are: general administrative, labor, statistics, commercial matters, traffic, technical and indirect export allowances.

In the board of directors and these



R. O. Griffis

several committees there is an aggregate of more than 80 men, all among the recognized leaders in their respective fields of activity, who have unselfishly devoted many days to the common interest of making the code effective for the whole industry. No one corporation ever had or ever could hope to have such a group working in its behalf as the members of the steel code have had working for them, without remuneration of any sort, during the past year.

One of the shafts of criticism leveled at the steel code from the outside has been the fact that the administration of the code is in the hands of "interested" steel men rather than some disinterested party or group. Consider, if you please, what outside party or group would be capable of handling the intricate and heavy task performed by these four score and more men whose expert knowledge and years of experience in highly specialized fields have been placed at the service of the industry since last August.

Prior to June, 1933, the total number of employes in the industry was about 338,000. Now, the total is more than 419,000, or very close to the largest number ever reported for the industry. In this connection it may be noted that the rate of operations in recent weeks, averaging about 55 per cent in terms of ingot production, has not been far from the estimated rate which was current prior to the effective date of the code, thus making it clear that the increase of more than 80,000 employes was not due to expanding output.

Wage rates have been voluntarily raised above the specified minimum levels, until now they are in most cases equal to or higher than the corresponding peak rates of five years ago.

As indicated by preliminary figures for April, compared with June of last year, the labor provisions of the code have increased the number of employes approximately 26 per cent; decreased the average hours per week per employe by nearly 14 per cent; added 35 per cent to the hourly earnings; and increased the total monthly payroll more than 47 per cent.

Complaints Unjustified

During these nine months of operating under the code, members of the indutsry appear to have done an extraordinary good job in adjusting their schedules to its labor provisions. Remarkably few complaints have been made, either by employes or by others, alleging violations of labor provisions.

The principal commercial provisions of the code relate to the filing of lists of base prices, the quoting and billing of delivered prices, the making of contracts, and terms and conditions of sale.

Commercial resolutions to the number of 59 have been recommended after consideration by the committee on commercial matters, and have been adopted by the board of directors.

As might be expected, various commercial provisions of the steel code have been the basis of some complaints, either on theoretical grounds or because of their alleged effects on the industry itself or on purchasers of its products. These complaints have resulted in two public reports, one by the federal trade commission and the other by the so-called Darrow board. Neither of those reports was written with any real knowledge of all the facts or with any understanding of the complex nature of the industry covered by the code

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and the important problems which it involves.

A comparison of current prices for the principal products at representative basing points with the first lists of base price filed last August shows only moderate increases during the interval of nine months. For example, the price for foundry pig iron is up less than 3 per cent. Among the semifinished products increases have been: for skelp, 6.3 per cent; for wire rods, 8.5 per cent; for billets, 11.5 per cent; for sheet bars, 15 per cent. Among the leading finished products the increases have been: for buttweld pipe, about 11 per cent; for shapes, plates and bars, 14 per cent, and for the flat rolled products about 19 per cent. As compared with the 35 per cent increase in wage rates during the same period, these are conservative.

Profit and Loss

In summarizing those reports from 190 members of the code, it appears that 57 integrated companies accounted for $100,000,000 of the increased payroll and $44,000,000 of the increased income; whereas 133 non-integrated companies account for only $8,000,000 of the increased payroll, but nearly $10,000,000 of the increased income. The integrated companies showed a net loss of nearly $65,000,000 for the year, approximately $12,000,000 of which was in the second half year. The non-integrated companies, on the other hand, showed for the second half year a net profit of $7,400,000, which after wiping out a loss of $2,300,000 in the first six months, left a net profit of more than $5,000,000 for the year. These facts do not lend any support to the agitator's cry that the steel code tends to oppress or to eliminate the small producer.

Equipment

Pittsburgh—Work on the United Engineering & Foundry Co.'s order for a strip-sheet mill for Ford Motor Co. is proceeding at the United company's Youngstown, O., works, although shipment is not expected until late this year. The equipment market, generally speaking, is somewhat quieter, with orders for the extensive equipment work for a leading Pittsburgh steelmaker still delayed. Plans of the Youngstown Sheet & Tube Co. to install a strip mill at Struthers, O., appear to be proceeding slowly with certain financing features reported holding up definite approval to proceed with construction.

Boston—Builders of heavier equipment are generally more active, especially several Connecticut shops. The leading Providence, R. I., shop is also more active while builders of special machinery generally have fair backlogs. Most textile mill equipment builders are operating at near capacity, largely on replacements.

Chicago—Machinery and equipment sales are fairly steady, with little change noted in the rate of inquiries. Railroads are entering the market for heavy equipment only occasionally, but are more active in the purchase of repair parts and small tools. Foundry equipment demand retains the marked betterment recorded so far this year. Gisholt Machine Co., Madison, Wis., is working on an order for five turret lathes for Soviet Russia and an order for three machines for England.

New York—A number of builders of heavier equipment are busier. Dealers and builders in the East are of the opinion that retooling in the automobile industry will be done earlier than usual. Smith-Courtney Co., Baltimore, is low on several boring mills for the navy at Norfolk, Va.

Cleveland—Labor troubles in this region, coupled with occasional acts of vandalism by strikers, are not smoothing the path any in closing on decisions to buy new equipment. Current sales are still ahead of last year's rate at this time, but have fallen off some from April. Prompt deliveries are possible now on most all items of new equipment. Used equipment is moving in fair volume.

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1 Shear blade Grinder 156″
1 Buckeye Steam Generator 220 K.W.
1 300 K.W. M.G. Set

1 12″ x 10″ Class E.R.1 Ingersoll Rand Air Compressor.
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Construction and Enterprise

New England

MERIDEN, CONN.—Business and assets of Parker Bros., Meriden, Conn., manufacturers of the Parker gun, will be acquired June 1 by the Remington Arms Co. Inc., New York. The Parker gun plant will be maintained.

MIDDLETOWN, CONN.—Remington Noiseless Typewriter Co., High street, has let general contract for 2-story additions, 60 x 120 and 30 x 70 feet for a press shop and other uses to H. K. Ferguson Co., 25 West Forty-third street, New York, at about $40,000.

TORRINGTON, CONN.—Torrington Co., ball bearings and metal specialties, has let contract to Torrington Building Co., 182 Church street, for a 1-story addition 50 x 225 feet, to cost over $60,000.

WATERBURY, CONN.—Atlas Machinery Co. Inc. has been formed by Louis and Samuel Rosenbaum, 36 Kingsbury street, and will manufacture machinery and machine parts.

HOPEDALE, MASS.—Draper Corp., textile machinery manufacturer, will build a three-story addition 140 x 160 feet, to cost over $400,000, on plans by F. P. Sheldon & Sons, Providence, R. I. (Noted May 14).

WOBURN, MASS.—New England Chemical Industries is planning to build a glue factory here.

Unless your men working on hot jobs are adequately cooled (especially in hot weather) you must stand the loss of their greatly reduced working efficiency. Coppus heat killers deliver a cool refreshing stream of air right to the "Hot Spot".

COPPUS ENGINEERING CORPORATION
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New York

BROOKLYN, N. Y.—Preferred Oil Co. Inc., 95 Front street, plans to build bulk oil storage and distributing plant on East river to cost over $80,000, including pumps, tanks and other equipment.

LACKAWANNA, N. Y.—Plant of the Spring Perch Co. recently was damaged by fire to the extent of $250,000 to $350,000.

NEW YORK—Sunrise Metal Stamping & Die Works Inc. has been formed by George Galante, 2149 East First street, Brooklyn, and will establish a plant to produce metal stampings and similar products.

NIAGARA FALLS, N. Y.—American Treibach Chemical Works Inc., C. Ganz president, 3303 Highland avenue, plans construction of a plant for the production of metallic cerium and other rare metals, eventually radium. Cost is estimated at $100,000 (Noted April 30).

New Jersey

BORDENTOWN, N. J.—Department of institutions and agencies, William J. Ellis, commissioner, state house, Trenton, N. J., is planning housing program at state prison farm here, including erection of power plant. Architect, division of architecture and construction, Charles N. Leathem, director, state house, Trenton, N. J.

IRVINGTON, N. J.—Utility Tube Co., Louis I. Braunstein, president, 146 Coit street, manufacturer of steel conduits and lead cable, has leased larger quarters at 153 Frelinghuysen avenue, Newark, N. J., for a new and larger plant.

Pennsylvania

AMBRIDGE, PA.—Interior of the metal construction plant of H. H. Robertson Co. here was damaged by fire May 17, loss amounting to about $3000.

ERIE, PA.—Erie Steel Construction Co. was awarded contract recently for two clam shell steel buckets for federal engineers at Pittsburgh.

PITTSBURGH—American Bridge Co. recently was awarded contract for horses and props for dam 28, Ohio river, by Pittsburgh federal engineers.

PHILADELPHIA — Air Reduction Sales Co., Germantown avenue and Allegheny avenue, has received bids for alterations and addition to its factory building.

PHILADELPHIA—F. J. Stokes Machine Co., East Tabor road, has awarded contract to Robert E. Lamb Co., 841 North Nineteenth street, for erection of factory building.

PHILADELPHIA—Frankford arsenal, Philadelphia, will receive bids May 31 on the following: Contract 34-589, drill grinding machine; contract 34-595, vertical spindle surface grinder; contract 34-590, straight bevel gear generator and bevel gear tools; contract 35-597, precision geared head toolroom lathe.

TITUSVILLE, PA.—Crew Levick Co., a subsidiary of Cities Service Co., 60 Wall street, New York, plans extensions and improvements to its refinery here. (Noted May 7).

TARENTUM, PA.—Borough of Tarentum, J. F. Conroy, secretary, Borough building, is receiving bids until June 1 for water filtering and softening plant, to cost approximately $75,000. Project is financed by PWA funds.

WARREN, PA.—New Process Co. has awarded contract to Lakeland Engineering & Construction Co., Electric building, Buffalo, for three-story factory. Biey & Lyman, 500 Delaware avenue, Buffalo, are architects.

YORK, PA.—York Ice Machinery Corp. has contract for air-conditioning equipment for two new lightweight, high-speed streamline trains to be built by American Car & Foundry Co., for Baltimore & Ohio railroad.

Ohio

AKRON, O.—Goodyear-Zeppelin Corp., 1144 East Market street, is considering a contract for construction of a light-weight streamlined train for the New York, New Haven & Hartford railroad. Power plant will be built by Winton Engine Co., Cleveland, or Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CLEVELAND—Premier Bronze Powder Co., Painesville, O., has not come to a decision whether to rebuild its plant, wrecked by dust explosion recently. Equipment to be replaced, if rebuilding is undertaken, is special, made from company's own patterns. George F. Glass, president of the Premier company, is also president of the Ohio Bronze Powder Co., 1120 East 152nd street, Cleveland.

CLEVELAND—Peter Witt Bus Co. is being incorporated by Peter Witt, Terrance Scullin and Charles Dennis, to manufacture a new type of bus for urban transportation. Manufacturing operations will be started as soon as a charter is obtained, in the former plant of the Stearns Knight Corp., Euclid avenue and Lakeview road, Cleveland. Stock will consist of 300 shares of 7 per cent preferred at $100 par and 300 shares of no par common.

CINCINNATI—United States engineer, 408 Customhouse, will receive, bids May 31 for portable air compressor, direct connected to gasoline engine through friction clutch and mounted on trailer, list 34/72.

JACKSON, O.—Fire in the engine room of the Globe Iron Co. mine near here caused damage of $10,000.

WARREN, O.—Hetz Construction Co., Warren, O., is dismantling the Thomas and Waddell plants of the Empire Steel Corp. at Niles, O., salvaging equipment and materials for further use. In addition to the buildings the company has for sale hot and cold mill housings, rolls and motors, cranes, boilers, normalizing furnace, sheet shears, scrap compressors, motor-generator sets, air compressors, gas producer and miscellaneous items.

Michigan

BATTLE CREEK, MICH.—Stockholders of the Food City Brewery Co.

have voted to increase capital from $350,000 to $525,000, to increase capacity to 200,000 barrels annually.

DETROIT—Wall Chemicals Ltd., Albert F. Wall, general manager, 1059 West Grand boulevard, Detroit, plans construction of a chemical plant at Windsor, Ont., to cost about $40,000.

ESCANABA, MICH.—Escanaba, Iron Mountain & Western railroad, subsidiary of Chicago & North Western railroad, 226 West Jackson boulevard, Chicago, has been granted a PWA loan of $3,500,000 to build an iron ore dock.

GRAND RAPIDS, MICH.—Earl H. Bekkering, Grand Rapids, Mich., has been awarded contract for construction of an addition to the plant of the Old Kent Brewing Co., formerly Imperial Brewing Co. Improvements will represent an outlay of over $75,000.

JACKSON, MICH.—Riverside Forge & Machine division of the Pittsburgh Forgings Co., 919 Amur street, plans to build an addition to its forge shop, 40 to 60 feet wide, south of the present plant. A heat treating department is planned for the extension. Permission to use Amur street in connection with the work is before the city council.

MT. CLEMENS, MICH.—Mt. Clemens Brewing Co. will erect a bottling plant and additions to its cellars.

PONTIAC, MICH.—Continued operation of the plant of the Wilson Foundry & Machine Co., Pontiac, and of the Willys-Overland Co. plant at Toledo, O., is being sought through a federal court order by D. R. Wilson, president of the Pontiac concern and receiver for Willys-Overland.

Indiana

ANDERSON, IND.—Anderson Stove Co. has begun operations in a new foundry building on South Jefferson street, an auxiliary plant. The company is operating at capacity.

GARY, IND.—Lake County Iron & Metal Co. Inc., Tenth and Virginia streets, has been incorporated to deal in scrap iron, by Ben Schultz, Ruth Schultz and Harold W. Kamin. Ben Schultz, 761 Connecticut street, is resident agent.

INDIANAPOLIS—Lafayette Wire & Iron Works Inc., 828 Massachusetts avenue, has been formed to manufacture iron, wire and metal products, by John W. Pringle, James M. Hamilton and Ralph Pringle.

WHITING, IND.—Union Carbide & Carbon Co., 30 East Forty-second street, New York, has bought 40 acres at Whiting and plans a plant to cost $500.000. (Noted May 14).

Illinois

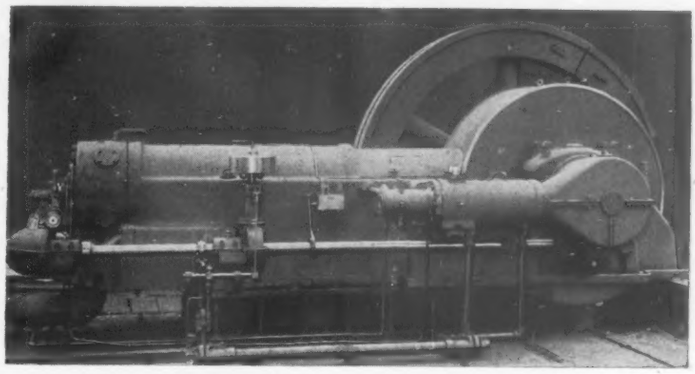
BUSHNELL, ILL.—City is having plans made by McBride Gas Engineering Co., care J. A. McBride Mechanical Equipment Co., 2815 Locust street, St. Louis, for a gas plant and distributing system, to cost about $80,000.

CHICAGO—Central Screw Co., 3501 Shields avenue, has let contract to E. L. Archibald Co. Inc., 111 West Washington street, for a 1-story addition, 74 x 110 feet.

CHICAGO—Invader Metal & Iron Co., 2018 Fowler street, has been incorporated by Jacob Sandman, Harry L. Sandman and Bertram A. Young, to deal in scrap metals and scrap iron. Correspondent: Louis Dunn, 134 North La Salle street.

CHICAGO—PWA has received and is considering an application from the Gaudy Engineering Service, 228 North LaSalle street, Chicago, for $20,000,000 to be spent for the development of a new aluminum industry. The application was made on behalf of the proposed Standard Aluminum & Alloy Co., Chicago, Decatur, Ala., and Bauxite, Ark. The plan calls for mining bauxite at Bauxite, Ark., and converting it into metallic aluminum and aluminum products at Decatur, Ala., or Tupelo, Miss., or both. Power from the works of the Tennessee Valley Authority, New Sprankle building, Knoxville, Tenn., may be made available for this purpose.

CHICAGO—Damage to buildings in stockyards district as result of fire May 19 estimated at $7,000,000. New construction to involve about $10,000,000, although plans not complete for some structures, and original framework of a few buildings may be used again. Stockyards pens, barns, runways expected to be rebuilt with fireproof construction. Important buildings destroyed or seri-



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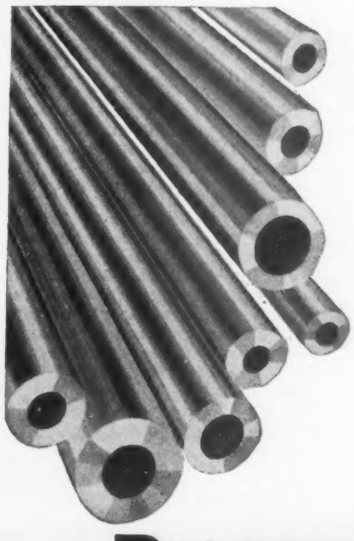

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GALVA, ILL.—Negotiations are under way between Illinois Foundry Co., Springfield, Ill., M. W. Baker, general manager, and Farm Tools Inc., Galva, Ill., C. A. Hines, manager, for rental of part of the foundry and machine shop of the Hayes Pump & Planter Co., division of Farm Tools Inc., for the production and machining of castings.

HARVEY, ILL.—Fahralloy Co., 146th street, has been incorporated to deal in alloy castings and other metal products, by Reuben A. Borsch, Thomas I. Underwood and Margaret Grorer. Correspondent: Winston, Strawn & Shaw, First National Bank building.

ROCKFORD, ILL.—Rockford Screw Products Co., 2905 Ninth street, has let contract to Linden & Sons Inc., 1102 Tenth street, for a 1-story addition 50 x 96 feet, for a heat treating department.

SULLIVAN, ILL.—City is having plans made by McBride Gas Engineering Co., care J. A. McBride Mechanical Equipment Co., 2815 Locust street, St. Louis, for a gas plant and distributing system, to cost $80,000.

District of Columbia

WASHINGTON—Miller Casket Co., Wheeling, W. Va., plans to erect a woodworking plant at New York avenue, northeast, in the Youngsborough area.

WASHINGTON—Veterans' administration, room 764, Arlington building, will receive bids until June 12 for construction and finishing incinerator at Veterans' Administration Facility, Marion, Ind.

WASHINGTON—Bureau of supplies and accounts, navy department, will receive bids June 1, schedule 2556, for horizontal centrifugal pumps, delivery Brooklyn, N. Y.

WASHINGTON—Bureau of supplies and accounts, navy department, will receive bids June 5, schedule 2538, for pumps (emergency feed, fire and bilge, and make-up feed), and spare parts for delivery Brooklyn, N. Y., and Philadelphia.

Florida

MIAMI, FLA.—Fuchs Baking Co. Inc., C. T. Fuchs, owner, 621 W. Flagler street, plans to expend $25,000 in converting theater building into bakery and installing machinery.

PAHOKEE, FLA.—City will receive bids June 19 for constructing $100,000 waterworks system. Rafn & Main, 112 Marion street, Daytona Beach, Fla., are engineers.

Georgia

ALBANY, GA.—City, C. Q. Wright, city manager, receives bids June 4 for furnishing refrigerating machinery, cooling coils, temperature control devices and additions and alterations to existing abattoir buildings.

Kentucky

LORETTO, KY.—Burks Spring Distilling Co., care L. C. Roberts, Loretto, plans remodeling and will build an addition to its distillery, at cost of about $28,000.

PARIS, KY.—City is planning to purchase additional diesel engine for power plant, to cost $50,000.

WARSAW, KY.—City, Herman Drees, mayor, will open bids June 7 for waterworks system, consisting of pump house, well and pumping machinery, and 60,000-gallon elevated steel tank and tower. C. N. Harrub Engineering Co., 711 American National Bank building, Nashville, Tenn., engineer.

Louisiana

LAKE CHARLES, LA.—Shell Petroleum Corp., Shell building, St. Louis, will start work June 1 on construction of gasoline plant to cost $150,000. Plant will be of oil-absorption type, with three 225-horsepower engines and one distillation unit.

NEW ORLEANS — Pan-American Distilling Corp., recently organized with Walter J. Trautman, president, 1501 American Bank building, is planning to erect a distillery.

OAKDALE, LA.—Planing mill and boiler house, at Mab, near here, owned by Hillyer Deutsch Edwards Inc., recently was damaged by fire.

Maryland

BALTIMORE—Yuspa Bros., 2300 Walbrook avenue, is low bidder for addition to dyeing plant at 239 Franklintown road for Stevens Star Cleaners & Dyers. New equipment will be installed. William Ganter & Associates, Knickerbocker building, are architects.

BALTIMORE—William F. Stone Jr., 2612 North Carolina street, architect, will issue call for bids soon for improvement program for Consolidated Beef & Provision Co., 100 South Exeter street, consisting of two additions and alterations to present building. New equipment such as cooking tanks and refrigeration units will be purchased

BALTIMORE—American Zirconium Corp. is building a plant to manufacture paint ingredients. A boiler house and 14 large tanks are included in the present construction program. Special equipment such as Dorr equipment, overhead cranes and milling machines will be required. The project when completed will represent an investment of approximately $500,000. Price Construction Co., Baltimore, is general contractor.

GRANTSVILLE, MD.—City receives bids May 31 for waterworks addition, to cost about $33,000.

HAGERSTOWN, MD.—Oil Burner & Air Conditioning Corp. has been incorporated by Louis R. Voris and Leo H. Miller.

Mississippi

LAUREL, MISS.—City, G. W. Hosey, mayor, has been granted $150,000 in FERA funds for establishment of starch plant from sweet potatoes.

North Carolina

NORTH WILKESBORO, N. C. — Town, W. P. Kelly, town clerk, will receive bids June for waterworks, including centrifugal pumps, two steel storage tanks, and steel water tank and tower.

South Carolina

CAMERON, S. C.—Commissioners of public works will receive bids until June 6 for construction of complete waterworks system, including tank foundation and building for deep well pumps, and 75,000-gallon elevated storage tank on 100-foot tower.

FORT MILL, S. C.—Blythe Bros., 422 South Brevard, Charlotte, N. C., have contract to erect sewage plant to cost $101,000.

GAFFNEY, S. C.—Piedmont Mining Co., David Banta, P. O. Box 604, wants used equipment for gold mine operation, including centrifugal pump and electric motors.

PROSPERITY, S. C.—Town, Allen N. Crosson, mayor, will open bids June 12 for waterworks system, consisting of deep wells, pumping machinery and equipment, elevated tank and other appurtenances. James E. Gibson, 14 George street, Charleston, S. C., engineer.

Tennessee

CENTERVILLE, TENN.—Town, Lem Allen, mayor, will receive bids May 31 for constructing sewer system. Freeland, Roberts & Co., Independent Life building, Nashville, Tenn., is engineer.

CHATTANOOGA, TENN.—Louis T. Klauder, Lincoln-Liberty building, Philadelphia, consulting engineer, has estimated $4,000,000 as cost of building a municipal power plant here.

GALLATIN, TENN.—City, H. E. Franklin, chairman of waterworks committee, will receive bids June 1 for waterworks improvements, including construction of filter building, installing pumps, furnishing and erecting 250,000,-gallon elevated tank and tower and supplying water pump and motor. C. H. Harrub Engineering Co., 711 American National Bank building, Nashville, Tenn., engineer.

KNOXVILLE, TENN. — Tennessee Valley Authority, New Sprankle building, is making a study of a power line to Memphis to cost approximately $3,-000,000. M. O. Swanson is power engineer.

NASHVILLE, TENN.—United States engineer office, P. O. Box 900, will receive bids June 11 for constructing and installing central control station, operating machinery, and electrical system for lock 2, General Joe Wheeler lock and dam, Tennessee river.

RIPLEY, TENN.—Ripley Box & Basket Co., H. C. Wilcox, president, plans rebuilding its woodworking plant, recently damaged by fire at a loss of $100,000.

West Virginia

CHARLESTON, W. VA.—Meanor &

Handloser, Payne building, architects, will have charge of constructing Red House Garden Farms Inc., a 1728-acre homestead project near Red House, W. Va. Project will include dwellings, 20 small shops, canning plant, woodworking plant, and water system.

MOOREFIELD, W. VA.—City will open bids May 31 for waterworks system. Tauszky & Zagari, Oak Hill, W. Va., are consulting engineers.

MOOREFIELD, W. VA.—Town, Freeman J. Kyle, consulting engineer, Capitol City Bank building, Charleston, W. Va., will receive bids May 31 for waterworks system to cost $50,000.

NEWELL, W. VA.—Allied Engineering Co., Columbus, O., has contract for re-equipping plant No. 5 with latest type machinery for Homer Laughlin China Co. Estimated cost $150,000.

PARSONS, W. VA.—City will receive bids soon for $81,000 waterworks. P. R. Hinkle, Parsons, W. Va., is consulting engineer.

RIPLEY, W. VA.—City, Burton Crow, clerk, will receive bids June 12 for constructing filtration plant and improvements to water system. J. Paul Blundon, Law building, Keyser, W. Va., is consulting engineer.

Virginia

BROADWAY, VA.—City plans waterworks and sewer system to cost $80,000. J. B. McCrary Co., Atlanta, Ga., is engineer.

BROADWAY, VA. — Town, Joe Rhodes, town clerk, will open bids June 7 for furnishing equipment and constructing water works system consisting of tank and tower, pumps and meters. J. B. McCrary Engineering Corp., Atlanta, Ga., engineer.

BURKEVILLE, VA. — City plans waterworks to cost $47,000. J. B. McCrary Co., Atlanta, Ga., is engineer.

DANVILLE, VA.—City is planning to expend $85,000 for waterworks extension. E. C. Brantley, Danville, Va., is engineer.

KILMARNOCK, VA.—Town has PWA loan of $41,000 and grant of $9000 to purchase privately-owned water system which it will enlarge, rebuild and modernize. L. A. Bodinek, Bowling Green, Va., is engineer.

NORFOLK, VA.—A combination sheet metal and electric shop for the navy yard, to cost $800,000 is included among the projects for improvement of naval facilities in the Norfolk-Portsmouth area.

RICHMOND, VA.—Kolb Baking Co. has awarded contract for 390 tons of structural steel to Richmond Structural Steel Co., Richmond, Va., for erection of a building.

Missouri

JEFFERSON CITY, MO.—State of Missouri, Governor Guy Park, voted $10,000,000 bonds for improvement of state penal eleemosynary institutions. The program also includes construction of a new penitentiary.

KIRKWOOD, MO.—Kaplan-McGowan Co., 315 North Seventh street, St. Louis, is low bidder at $32,796 for sewage disposal plant. J. N. Wilson is city engineer.

MILAN, MO.—Milan Canning & Mfg. Co. has been former by C. T. Goodwin and J. C. Riggen.

SPRINGFIELD, MO.—Ozark Hills Distilleries Inc. has been formed with capital of $60,000 by O. E. Jennings, Kirkwood, Mo., and A. T. Brown, Fordland, Mo.

Arkansas

PRAIRIE GROVE, ARK.—J. P. Mullins, Pine Bluff, Ark., has contract at $32,000 for sewage disposal plant. This is a PWA project.

WALDO, ARK.—City, W. D. McKay, Magnolia, Ark., attorney, had has loan approved for constructing waterworks.

Oklahoma

TULSA, OKLA.—Sparton Aircraft Co., Sheridan road, will manufacture airplane engines developed by B. L. Edda. Sherman, Tex.

Texas

BYERS, TEX.—City, H. D. Vaughter Jr., mayor, has made application for loan and grant of $31,740 for waterworks. Montgomery & Ward, Harvey-Snider building, Wichita Falls, Tex., are engineers.

CANADIAN, TEX.—City, E. C. Fisher, mayor, has voted $24,000 bonds for installing service pump and water mains. J. H. Gebaur, Canadian, Tex., is consulting engineer.

CROSBY, TEX.—J. V. Gregory, Needville, Tex., is erecting an all-steel, continental brush-type gin to cost $15,000.

EL PASO, TEX.—Harnischfeger Sales Corp., 4400 West National avenue, Milwaukee, has contract at $44,742 for furnishing two drag-line excavators for international boundary commission, El Paso, Tex.

FORT STOCKTON, TEX.—City, H. L. Winfield, mayor, has $60,000 loan and grant approved and will call for bids soon for sewer system. Terrell Bartlett Inc., Smith-Young Tower, San Antonio, Tex., is engineer.

GLADEWATER, TEX. — Spencer-Harris Machine & Tool Co. has been formed by C. E. Dawson and Lee Spencer.

HOUSTON, TEX.—City will vote June 16 on $2,502,000 bonds for waterworks improvements.

HOUSTON, TEX.—Houston Gardens Inc., 3209 Gulf building, will receive bids May 30 for tools and erecting steel tower and water tank.

HOUSTON, TEX.—City plans voting at special election in about six weeks on $2,500,000 bonds for improvements to waterworks.

LAREDO, TEX.—Laredo Machine & Supply Co. has been organized with capital stock of $10,000, by Don Danvers, K. D. Harrison and Thomas H. Word, to deal in metal products.

RAYMONDVILLE, TEX. — Willacy county water control and improvement district No. 1 has loan and grant of $4,853,000 for irrigation work, including river pumping plant and 286 relift

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BENDING ROLL—25' 6" NILES-BEMENT-POND Plate. Pyramid Type. Arranged for MD. Top roll 24-7/8" dia. Bottom rolls 18" dia. Cap. 1" plate. Drop end housing.
CRANE—5-T. SHEPARD Overhead Elec. Trav., 52' 4" span, 230 v. DC. Also equipped for bucket & magnet operation. 350 feet of Double "A" Frame Runway.
DRILL—Radial. CINCINNATI-BICKFORD 5' with 13" column, rectangular base, table and 10 HP 440/3/60 motor.
FURNACE—500-lb. MOORE Rapid 'Lectromelt for electric steel melting, 3 phase with complete electrical equipment including Transformer, 2200 to 120 volt AC.
LATHE—26" x 16' BRIDGEFORD Quick Change Geared Head Engine with taper attachment and chuck.
MAGNET—45" ELECTRIC CONTROLLER MFG. CO., 230 V. DC.
PLANER—30" x 10' LIBERTY with two heads on rail, rapid traverse and 10 HP 440/3/60 motor.
PRESSES—No. 12 BLISS Straight Side, Double Crank, Double Geared, Single Action. 14" stroke. Bed area 52 x 84". Shaft dia. 12" at bearings; 13" at pins. Arranged for MD and motor adjustment. Wgt. 200,000 lbs.
No. 6-1/2 BLISS Straight Side, Double Crank with spring counterbalance. Belt Drive. 54" between housings. 8" stroke.
SHAPER—32" COLUMBIA High Duty. Quick Change Speedbox. Arranged for direct connected constant speed motor drive.
SHEAR—No. 10 BUFFALO for bars and shapes. Capacity up to 3-7/8" rounds and corresponding duty in shapes. Direct connected AC MD with motor.

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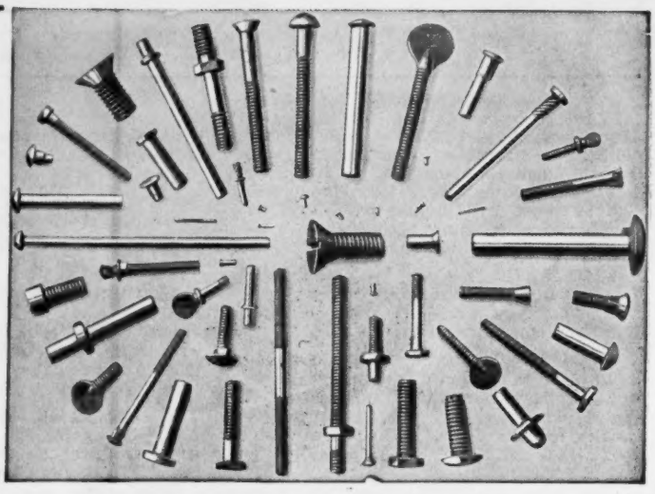

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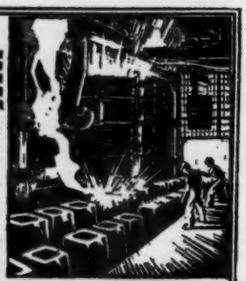

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and small pump units. Will call for bids soon. Morgan Engineering Co., box 1046, Harlingen, Tex., is consulting engineer, and B. E. Drier, is project engineer.

RIO GRANDE CITY, TEX.—D. J. N. Goodwin and Dr. G. R. Yantis, McAllen, Tex., and Rio Grande Public Service Corp. are planning to construct a pipe line from Rio Grande City in Starr county, to carry natural gas produced in Starr county fields into cities along a 100-mile route to Brownsville, Tex. Estimated cost is $500,000.

SOUTHTON, TEX.—United States government, care of T. J. Adams, executive secretary, federal transient bureau, 419 South St. Marys street, San Antonio, Tex., has plans for transient bureau buildings, including shop building. Harvey P. Smith, National Bank of Commerce, San Antonio, architect.

STAMFORD, TEX.—City, E. P. Bunkley, mayor, voted $154,000 bonds for waterworks. W. J. Powell, Republic Bank building, Dallas, Tex., is engineer.

Wisconsin

CHETEK, WIS.—Chetek Canning Co. has been formed with $16,000 capital to operate a canning factory, by H. E. Beckwith, J. Edward Erickson and M. I. Berg.

GILLETTE, WIS.—Northern Veneer Products Corp. has been incorporated with capital stock of $60,000 to manufacture wood veneer products, by L. P. Lehner, I. Weeks, W. W. Smith, C. W. Gilmer and W. J. Giese.

MILWAUKEE—Super Lubricator Co. has been organized to deal in iron and steel, by J. L. Schwabe Jr., M. Schwabe and J. Hryniewski.

MILWAUKEE — Crucible - Electric Steel Casting Co. has been formed to conduct a general foundry business, by W. W. Lange, John H. Schlintz and M. E. Borkenhagen.

MILWAUKEE—Froedtert Grain & Malting Co., Thirty-third avenue and Grant street, has awarded 550 tons of structural steel to Worden-Allen Co., Milwaukee, for construction of malthouse.

PLYMOUTH, WIS.—Plymouth Box Co. has been incorporated with capital of $25,000 to manufacture boxes, barrels, crates, chests, etc., by F. J. Rhode, C. A. Eckburg and L. G. Butler.

Minnesota

BENSON, MINN.—City will take bids in June for alterations and improvements to municipal power plant, including new 350-horsepower boiler, stokers and superheaters, to cost $60,000. S. A. Berg is city clerk. Burlingame & Hitchcock, 525 Sexton building, Minneapolis, are engineers.

DETROIT LAKES, MINN.—J. B. Sprafka is rebuilding his sawmill, destroyed by fire April 26, with a loss of about $15,000.

LE CENTER, MINN.—Lyons Silo & Snow Fence Co., John T. Lyons, president, plans to rebuild factory destroyed by fire recently at a loss of $30,000.

MINNEAPOLIS — Northern Pump Co., C. H. Juckes, secretary-treasurer, has awarded contract to R. J. Keehn, 621 South Third street, for one-story factory addition, 38 x 127 feet.

MINNEAPOLIS — Standard Spring Co., manufacturer of truck and automobile springs, has moved to larger quarters at 17 Second street, north, having 8000 square feet of floor space and doubling the space formerly used. Robert S. Babcock is president. The company maintains its own furnaces and testing plant.

MONTEVIDEO, MINN. — Chippewa Brewing Co. plans to start work in June rehabilitating its brewery at cost of $175,000. Wesley G. Wells, 1455 Edmund street, St. Paul, is architect and engineer.

WABASHA, MINN.—Wabasha Roller Mills Co. has awarded contract for rebuilding power house, including installation of new diesel engines.

South Dakota

ABERDEEN, S. DAK.—City council, Lydia W. Kohlhoff, city auditor, will receive bids until June 1 for sewer system and sewage disposal plant addition, including screen clarifier, sludge pump and digester units. Alvord, Burdick & Howson, 1401 Civic Opera House building, Chicago, are engineers.

RAPID CITY, S. DAK.—Rapid City Packing Co., Walter Mollers, general manager, has started work on a one-story packing plant, 90 x 125 feet.

Iowa

DES MOINES, IOWA—Kellogg Grain & Elevator Corp., Arthur E. Cobb, manager, has awarded contract to James Stewart Corp., 343 Dearborn street, Chicago, for a grain elevator addition and storage tanks, including grain sorting and conveying machinery, to cost $200,000.

MILFORD, IOWA—J. E. Shelledy, town clerk, is receiving bids for municipal power and light plant and electrical distribution system, including cooling pond, fuel oil storage tank, two diesel-engine generator sets, etc., to cost $75,000. Buell & Winter Engineering Co., 503 Insurance Exchange building, Sioux City, Iowa, is engineer.

SIOUX CITY, IOWA—An election will be called soon on question of issuing $2,500,000 in bonds for a municipal electric light and power plant, court having approved petition.

WATERLOO, IOWA—Galloway Co. has been incorporated with capital stock of $200,000 by C. E. Butler and W. H. Langlas, to manufacture gas engines and agricultural implements.

Nebraska

HASTINGS, NEBR.—City has had plans completed and bids will be taken soon for extension to municipal light plant, including boiler, superheater, air heaters, 25-ton overhead crane, pulverizer, soot blowers, etc., to cost about $160,000. L. T. Waterman is city clerk. Black & Veatch, Kansas City, Mo., are engineers.

Montana

MISSOULA, MONT.—Northern Pacific railroad, Railroad building, St. Paul, will build an addition to round house to provide three or more engine stalls. O. M. Rognan, 1228 Railroad building, St. Paul, is company architect.

Utah

GARFIELD, UTAH — American Smelting & Refining Co., W. J. O'Connor, engineer, Salt Lake City, Utah, plans improvements to its smelting plant at Garfield, to cost about $150,000.

Pacific Coast

IMPERIAL, CALIF.—Imperial irrigation district is planning to build an electric power plant here or at Brawley, Calif. Estimated cost of project is $400,000. M. J. Dowd is chief engineer of the district.

LOS ANGELES—Plummer, Wurdeman & Beckett, architects, 1108 Story building, have applied for building permit for construction of a one-story reinforced concrete power house for Jessie M. Murphy, to cost $5000.

LOS ANGELES—Los Angeles engineering department will build a one-story, steel frame and corrugated iron truck repair shop building at 2527 East Washington boulevard, to cost about $10,000.

LOS ANGELES—Los Angeles board of education has adopted a revised program for rehabilitation of Los Angeles schools, using the $11,706,336 now available. Machine shops will be installed in eight of these schools.

SAN FRANCISCO—A. Nelson, 242 Ocean avenue, has been awarded contract at $90,000 to construct a marine repair shop at Fort Mason.

PORTLAND, OREG.—Hoffman Construction Co. has contract to construct a filtration plant, including concrete tanks, at West Linn, Oreg., for the Crown-Willamette Paper Co.

SEATTLE — Washington Corrugated Culvert Co., formerly Spokane Culvert & Tank Co., is installing equipment in a new plant at Twenty-sixth street and Iowa avenue. M. R. Ambuhl is Seattle manager.

SEATTLE—Northern Pacific railroad, Railroad building, St. Paul, will build a five-stall brick and steel roundhouse addition to cost $25,000. O. M. Rognan, 1228 Railroad building, St. Paul, is company architect.

SPOKANE—City will receive bids May 31 for furnishing a standard flat bottom steel water tank, with capacity of 300,000 gallons.

SUMNER, WASH.—R. J. Rayson, president, Washington Wineries Inc., announces his company will erect a $100,000 plant.

TACOMA, WASH. — Independent Brewing Co. Inc., 511 Middle Waterway, has permit to build a three-story brewing plant, 68 x 116 feet.

WENATCHEE, WASH.—Voters have approved a $1,000,000 bond issue for a water system, providing the government will aid to the extent of $300,000. Estimated cost is $1,154,700, including pumping equipment.

YAKIMA, WASH.—Texas Co. has obtained a site on which it is planning to construct offices, warehouse, pump house and storage tanks.

Dominion of Canada

VANCOUVER, B. C.—Surveys and preliminary work on a central heating plant will be put under way at once by E. J. Ryan Construction Co. Ltd., contractor. H. A. Flood, Tacoma, Wash., has the franchise and will remove here and organize the Vancouver Steam Corp. Ltd.

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